Hydrograph Plot

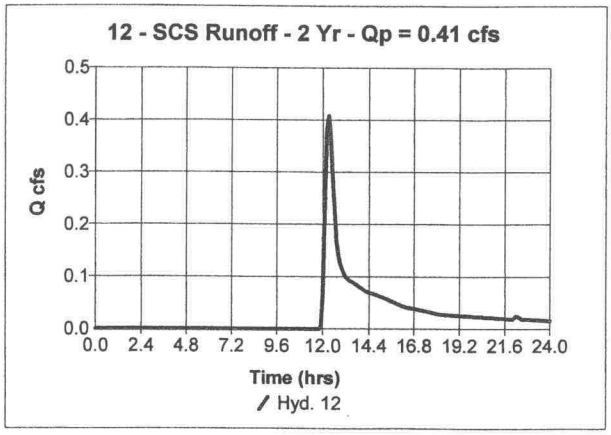
Hydraflow Hydrographs by Intelisolve

Hyd. No. 12

PROP WS IV

Hydrograph type	= SCS Runoff	Peak discharge	= 0.41 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 1.50 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12.8 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,427 cuft



TR55 Tc Worksheet

Page 1

Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

WS IV Existing
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.240
Flow length	= 160.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 5.0 %
Travel Time	**= 14.6 min**

Shallow Concentrated Flow

Flow length	= 0 ft
Watercourse slope	= 0.0 %
Surface description	= Unpaved
Average velocity	= 0.00 ft/s
Travel Time	**= 0.0 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc **= 14.6 min**

Hydrograph Plot

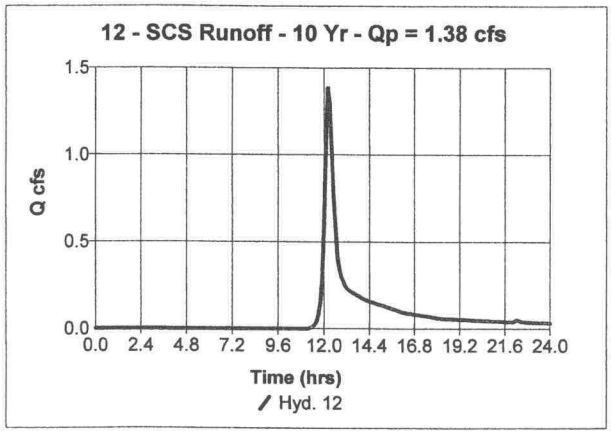
Hydraflow Hydrographs by Intelisolve

Hyd. No. 12

PROP WS IV

Hydrograph type	= SCS Runoff	Peak discharge	= 1.38 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 1.50 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12.8 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6,441 cuft



Hydrograph Plot

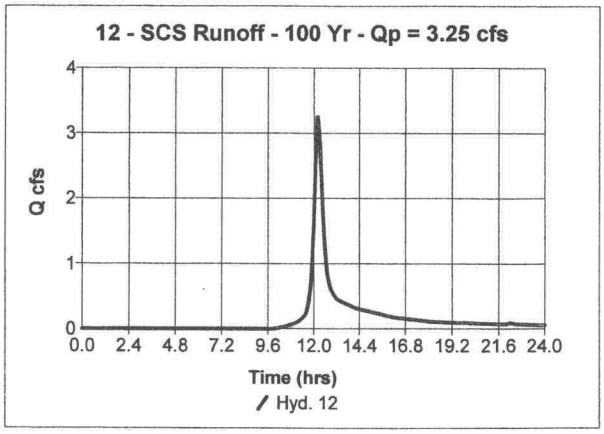
Hydraflow Hydrographs by Intelisolve

Hyd. No. 12

PROP WS IV

Hydrograph type	= SCS Runoff	Peak discharge	= 3.25 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 1.50 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12.8 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 14,049 cuft



WATERSHED IV
POSTDEVELOPMENT.

Hydrograph Plot

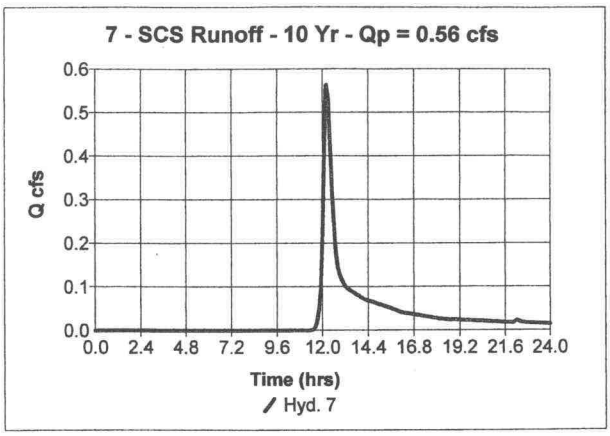
Hydraflow Hydrographs by Intelisolve

Hyd. No. 7

WS V

Hydrograph type	= SCS Runoff	Peak discharge	= 0.56 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 0.70 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.3 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,705 cuft



Hydrograph Plot

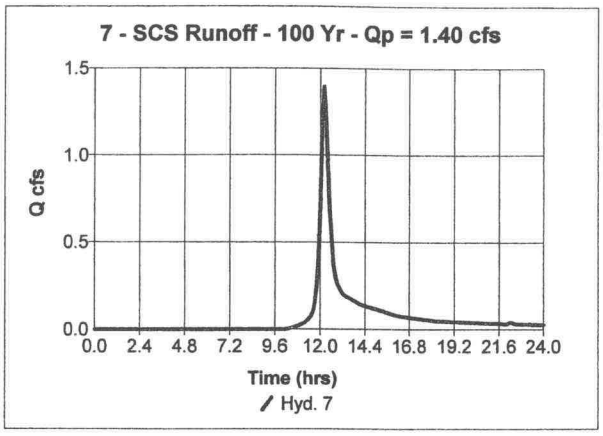
Hydraflow Hydrographs by Intelisolve

Hyd. No. 7

WS V

Hydrograph type	= SCS Runoff	Peak discharge	= 1.40 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 0.70 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.3 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6,095 cuft



TR55 Tc Worksheet

Page 1

Hydraflow Hydrographs by Intelisolve

Hyd. No. 7

Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.240
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 3.8 %
Travel Time	**= 11.3 min**

Shallow Concentrated Flow

Flow length	= 0 ft
Watercourse slope	= 0.0 %
Surface description	= Paved
Average velocity	= 0.00 ft/s
Travel Time	**= 0.0 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc **= 11.3 min**

Hydrograph Plot

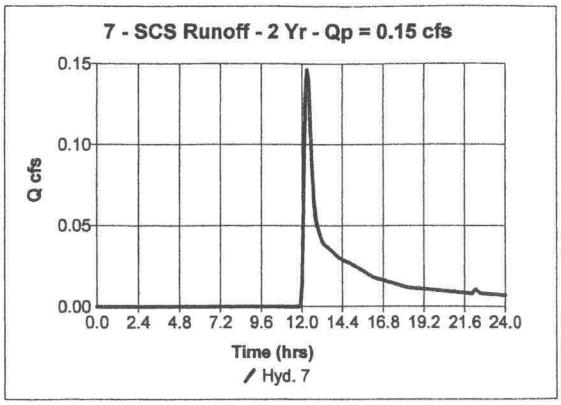
Hydraflow Hydrographs by Intelisolve

Hyd. No. 7

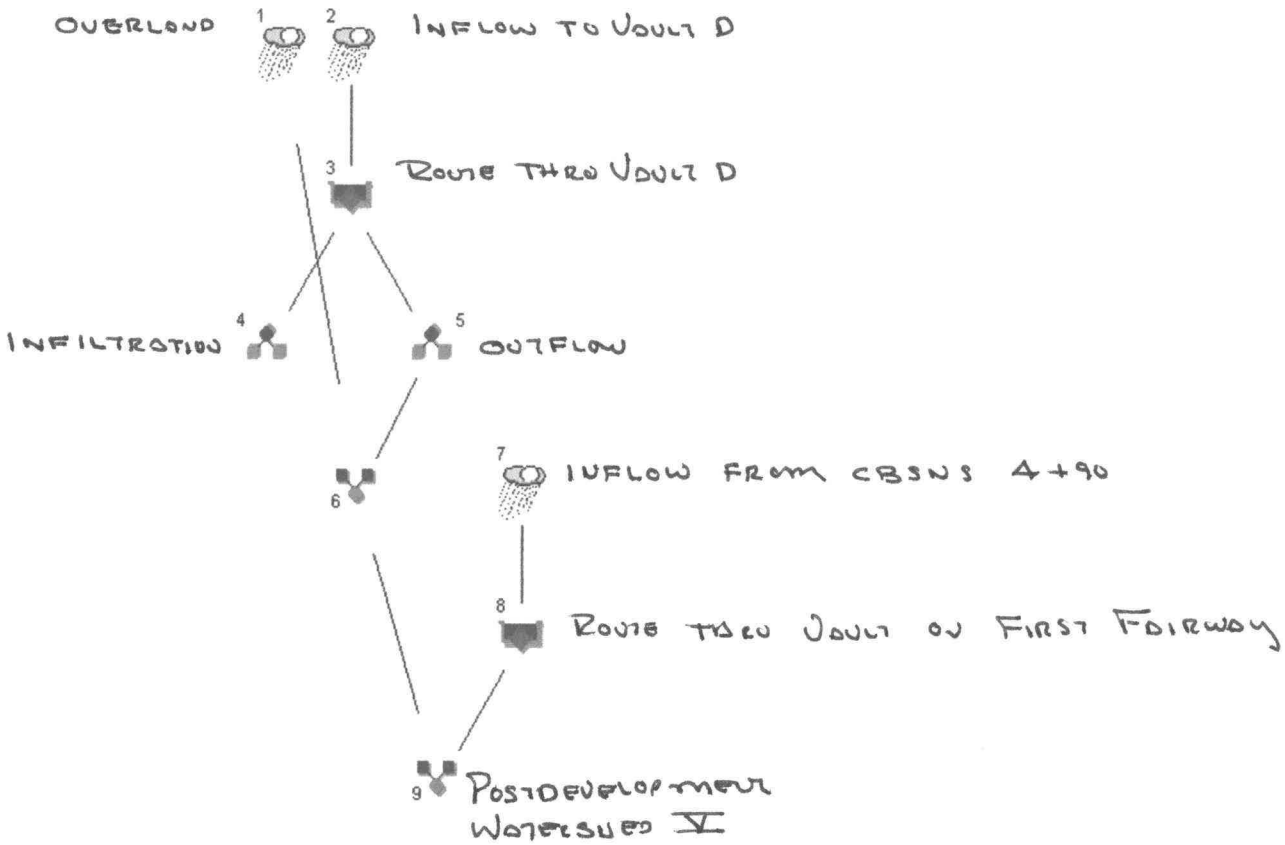
WS V

Hydrograph type	= SCS Runoff	Peak discharge	= 0.15 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 0.70 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.3 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 962 cuft



PREDEVELOPMENT
WATER SHED V



WATERSHED V
POST DEVELOPMENT.

Hydraflow Hydrographs Diagram	Project: NM WS V.gpw	10-29-2008

TR55 Tc Worksheet

Hyd. No. 1

WS V OVERLAND
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.240
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 5.5 %
Travel Time	**= 9.7 min**

Shallow Concentrated Flow

Flow length	= 0 ft
Watercourse slope	= 0.0 %
Surface description	= Paved
Average velocity	= 0.00 ft/s
Travel Time	**= 0.0 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc ..... **= 9.7 min**

Hydrograph Plot

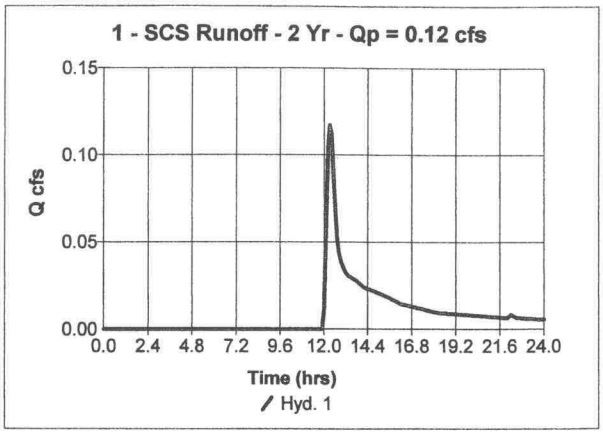
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

WS V OVERLAND

Hydrograph type	= SCS Runoff	Peak discharge	= 0.12 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 0.56 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 9.7 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 770 cuft



Hydrograph Plot

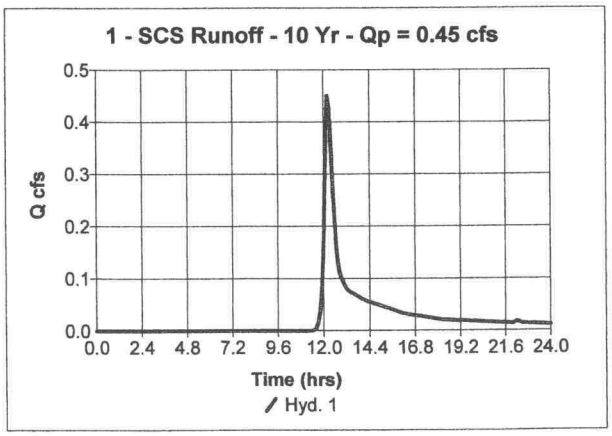
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

WS V OVERLAND

Hydrograph type	= SCS Runoff	Peak discharge	= 0.45 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 0.56 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 9.7 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,164 cuft



Hydrograph Plot

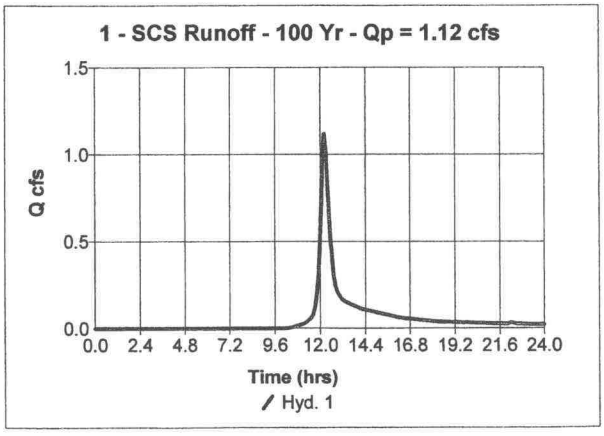
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

WS V OVERLAND

Hydrograph type	= SCS Runoff	Peak discharge	= 1.12 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 0.56 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 9.7 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4,876 cuft



POST DEVELOPMENT.
OVERLAND.

Hydrograph Plot

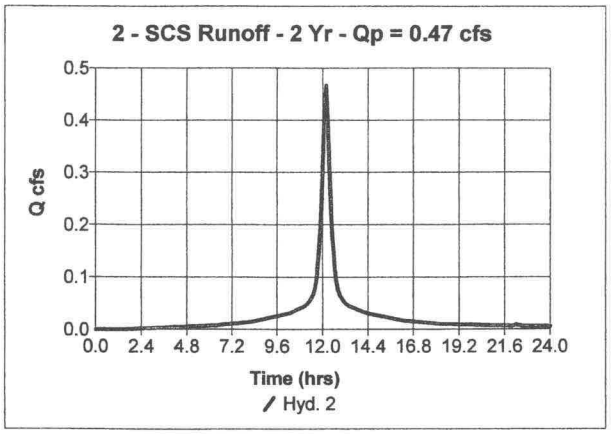
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

INFLOW TO INFILT./STOR D

Hydrograph type	= SCS Runoff	Peak discharge	= 0.47 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 0.23 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,245 cuft



Hydrograph Plot

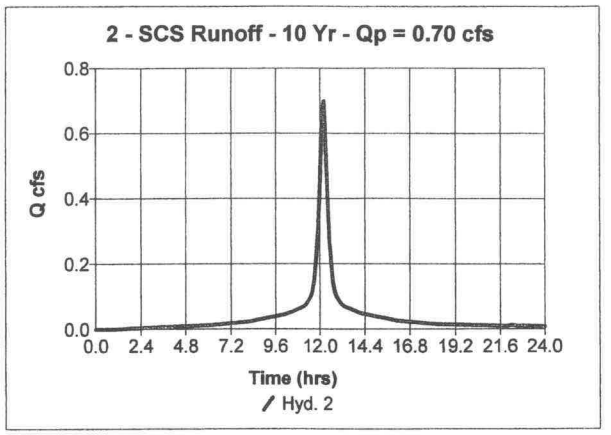
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

INFLOW TO INFILT./STOR D

Hydrograph type	= SCS Runoff	Peak discharge	= 0.70 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 0.23 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,416 cuft



Hydrograph Plot

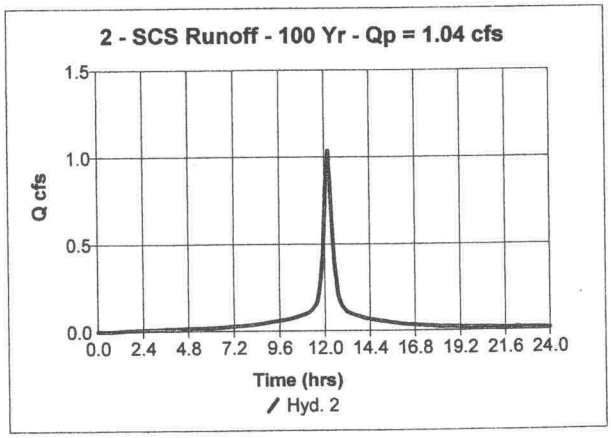
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

INFLOW TO INFILT./STOR D

Hydrograph type	= SCS Runoff	Peak discharge	= 1.04 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 0.23 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5,135 cuft



INFLOW TO VAULT D

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

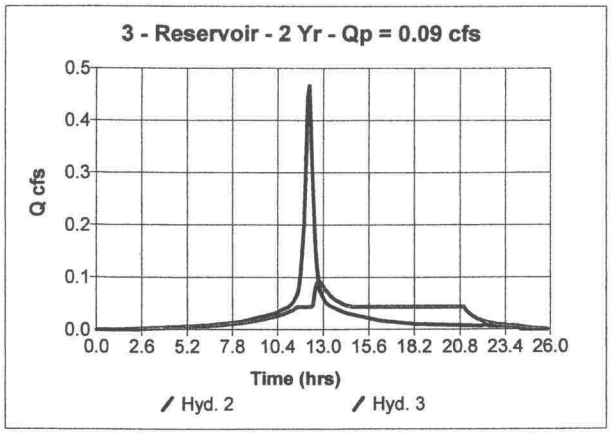
Hyd. No. 3

ROUTE THRU VAULT D

Hydrograph type	= Reservoir	Peak discharge	= 0.09 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyd. No.	= 2	Reservoir name	= INFILT/STOR. V/
Max. Elevation	= 101.17 ft	Max. Storage	= 911 cuft

Storage indication method used.

Hydrograph Volume = 2,242 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

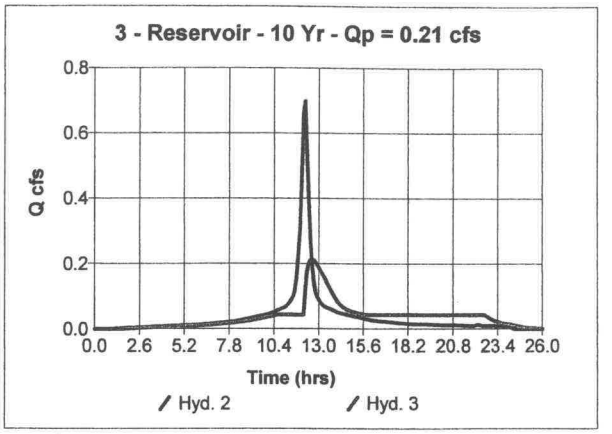
Hyd. No. 3

ROUTE THRU VAULT D

Hydrograph type	= Reservoir	Peak discharge	= 0.21 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyd. No.	= 2	Reservoir name	= INFILT/STOR. V
Max. Elevation	= 101.64 ft	Max. Storage	= 1,281 cuft

Storage indication method used.

Hydrograph Volume = 3,413 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

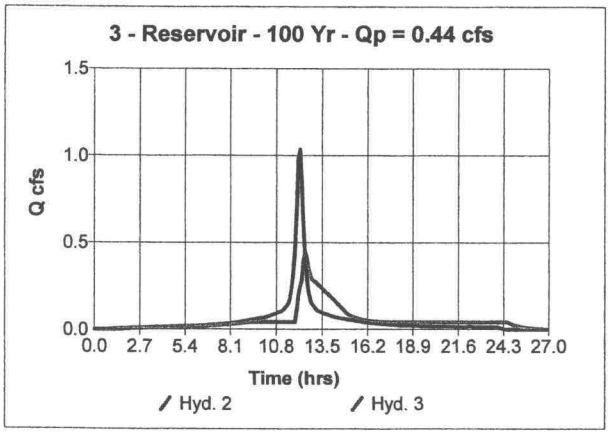
Hyd. No. 3

ROUTE THRU VAULT D

Hydrograph type	= Reservoir	Peak discharge	= 0.44 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyd. No.	= 2	Reservoir name	= INFILT/STOR. VA
Max. Elevation	= 102.42 ft	Max. Storage	= 1,884 cuft

Storage indication method used.

Hydrograph Volume = 5,133 cuft



ROUTE THROUGH VAULT D
(SAME VAULT AS A, B & C
IN WATERSHED III)

Hydrograph Plot

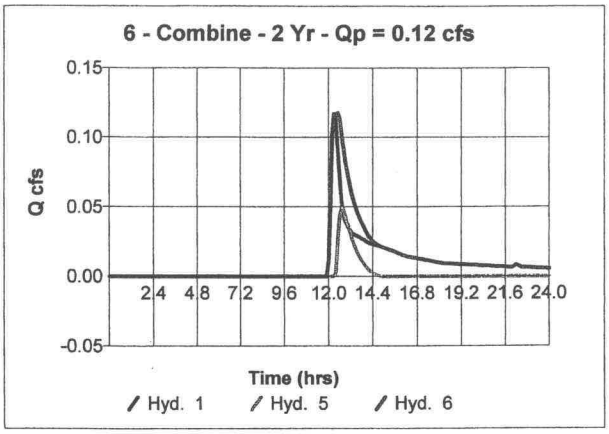
Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

POSTDEVELOPMENT

Hydrograph type	= Combine	Peak discharge	= 0.12 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyds.	= 1, 5		

Hydrograph Volume = 936 cuft



Hydrograph Plot

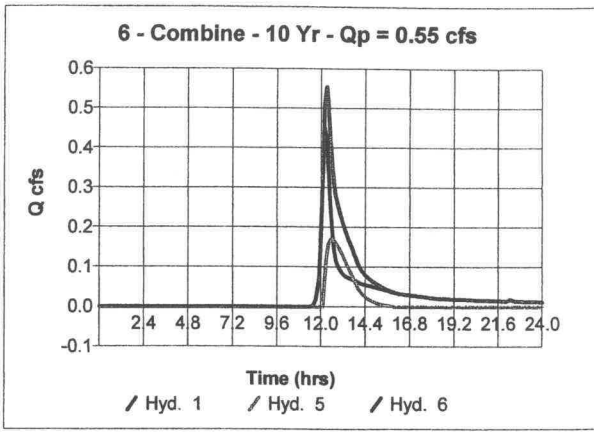
Hydraflow Hydrographs by Intelisolv

Hyd. No. 6

POSTDEVELOPMENT

Hydrograph type	= Combine	Peak discharge	= 0.55 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyds.	= 1, 5		

Hydrograph Volume = 3,053 cuf



Hydrograph Plot

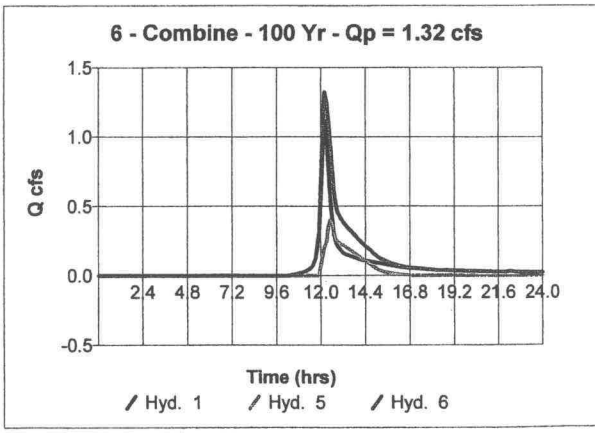
Hydraflow Hydrographs by Intelisolv

Hyd. No. 6

POSTDEVELOPMENT

Hydrograph type	= Combine	Peak discharge	= 1.32 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 1, 5		

Hydrograph Volume = 7,005 cuf



WATERSHED ~~E~~ V
POSTDEVELOPMENT
(EXCLUDING VAULT ON FIRST FAIRWAY)
SEE NEXT PAGE

Hydrograph Plot

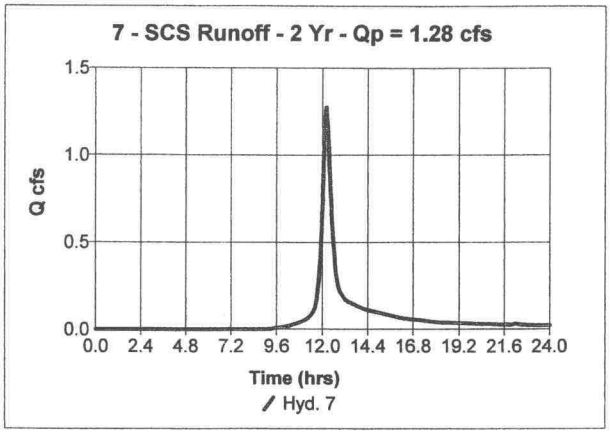
Hydraflow Hydrographs by Intelisolve

Hyd. No. 7

INFLOW FROM CB'S 4-90

Hydrograph type	= SCS Runoff	Peak discharge	= 1.28 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 1.10 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.8 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5,458 cuft



TR55 Tc Worksheet

Hydraflow Hydro

Hyd. No. 7

INFLOW FROM CB'S 4-90
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.240
Flow length	= 65.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 1.0 %
Travel Time	**= 13.6 min**

Shallow Concentrated Flow

Flow length	= 125 ft
Watercourse slope	= 0.7 %
Surface description	= Paved
Average velocity	= 1.70 ft/s
Travel Time	**= 1.2 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc ..... **= 14.8 min**

Hydrograph Plot

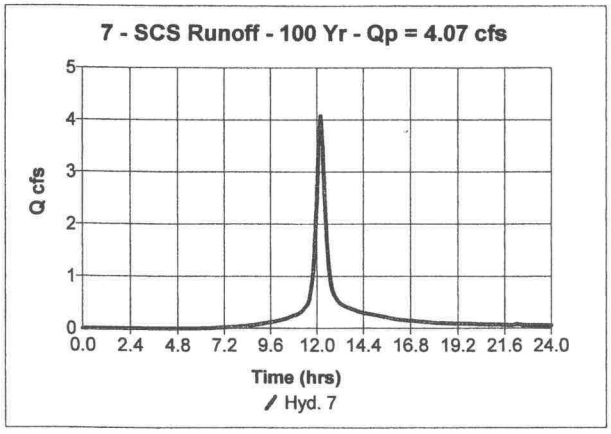
Hydraflow Hydrographs by Intelisolve

Hyd. No. 7

INFLOW FROM CB'S 4-90

Hydrograph type	= SCS Runoff	Peak discharge	= 4.07 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 1.10 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.8 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 17,703 cuft



Hydrograph Plot

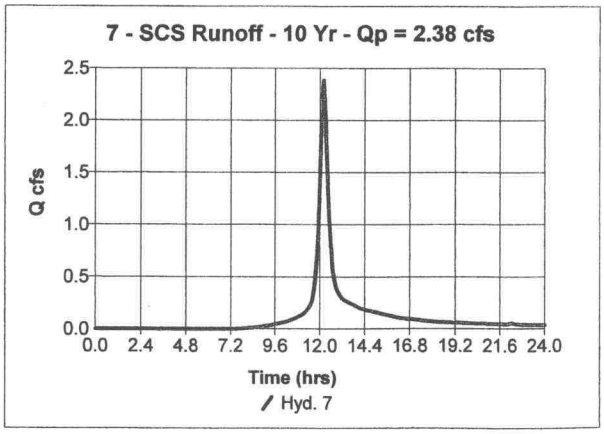
Hydraflow Hydrographs by Intelisolve

Hyd. No. 7

INFLOW FROM CB'S 4-90

Hydrograph type	= SCS Runoff	Peak discharge	= 2.38 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 1.10 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.8 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 10,197 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

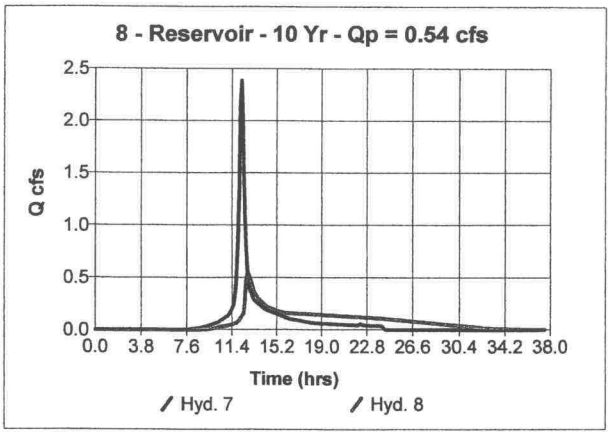
Hyd. No. 8

ROUTE THRU VAULT 1ST

Hydrograph type	= Reservoir	Peak discharge	= 0.54 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyd. No.	= 7	Reservoir name	= VAULT FIRST FAI
Max. Elevation	= 60.85 ft	Max. Storage	= 4,891 cuft

Storage indication method used.

Hydrograph Volume = 10,155 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

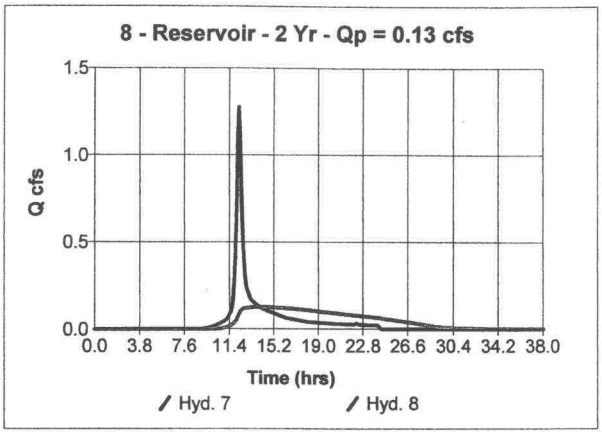
Hyd. No. 8

ROUTE THRU VAULT 1ST

Hydrograph type	= Reservoir	Peak discharge	= 0.13 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyd. No.	= 7	Reservoir name	= VAULT FIRST F
Max. Elevation	= 59.61 ft	Max. Storage	= 2,768 cuft

Storage indication method used.

Hydrograph Volume = 5,417 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

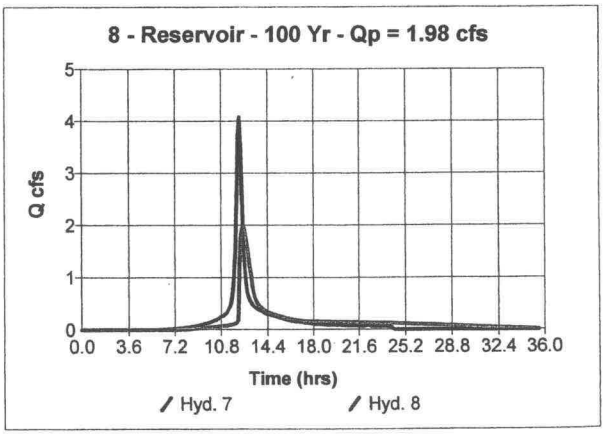
Hyd. No. 8

ROUTE THRU VAULT 1ST

Hydrograph type	= Reservoir	Peak discharge	= 1.98 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyd. No.	= 7	Reservoir name	= VAULT FIRST FA
Max. Elevation	= 61.98 ft	Max. Storage	= 6,824 cuft

Storage indication method used.

Hydrograph Volume = 17,661 cuft



Eastern Land Survey Associates, Inc.

Professional Land Surveyors & Civil Engineers
ESSEX SURVEY SERVICE 1958 - 1986
OSBORN PALMER 1911 - 1970
BRADFORD & WEED 1885 - 1972

STORMWATER MANAGEMENT REPORT
NEW MEADOWS
30 WILDES ROAD
ASSESSOR'S MAP 8 LOTS 4 & 5
TOPSFIELD, MA. 01983

OCTOBER 2008

Owner/Applicant:

New Meadows Enterprises, LLC
5 Turnpike Road
Ipswich, MA. 01938
(978)-887-3100

Engineer:

Clayton A. Morin, P.E. 30969 (Mass.)
Eastern Land Survey Associates, Inc.
104 Lowell Street
Peabody, MA. 01960

TABLE OF CONTENTS

SECTION 1
SITE CONDITIONS

SITE CONDITIONS

Existing Conditions

The site of the New Meadows Condominiums is to be located on the 52.25 acre site comprising the New Meadows Golf Course on Wildes Road in Topsfield, Massachusetts. The portion of the site within which new work is proposed is currently comprised of a wooded area, an existing parking lot, two dwellings, a maintenance building and portions of the first and second fairways.

The site of proposed work is bounded to the south by Wildes Road, to the west by Land of 461 Boston Street Realty Trust and the third and second holes of the golf course and to the east by the first fairway and the clubhouse.

The runoff from the proposed development site flows toward Hobbs Brook which forms the westerly boundary of the golf course.

Soil Conditions

A review of the NCRS database indicates the site of proposed development activities to be underlain by Hinkley, Sudbury and Canton Soils. Hinkley soils are classified as hydrologic soil Group A, while Sudbury and Canton soils are classified as Group B soils.

On site soil testing has been performed in the area of the proposed septic system as well as potential stormwater infiltration sites. That work has been accomplished by Alexander Parker, a certified soil evaluator in the Commonwealth of Massachusetts and a graduate Geologist. Copies of test pit evaluation summaries are provided in Section Four of this document.

Proposed additional test holes are depicted on Sheets 7 and 8 of the Site Plan. These holes are to be excavated and evaluated following the close of the 2008 golf season.

Resource Areas

Resource areas within 100 feet of proposed development or redevelopment activities were delineated under an ANRAD by the Topsfield Conservation Commission in April of 2008. Those resource areas include bordering vegetated wetland, bank and isolated vegetated wetland. The riverfront area associated with Hobbs Brook will not be impacted by proposed work described in the Notice of Intent.

SECTION 2
STORMWATER MANAGEMENT

STORMWATER MANAGEMENT

Project Description

The project consists of the development of 24 units of condominium style housing in six buildings under the provisions of the Elderly Housing Overlay District requirements of the Topsfield Zoning By-Law on a portion of the New Meadows Golf Course on Wildes Road in Topsfield, MA. In addition, a main drive, unit drives, underground utilities, a septic system, stormwater management system and landscaping will also be constructed.

The existing parking lot adjacent to the clubhouse will be removed and a new parking facility constructed. That facility will include stormwater best management practices and will thus improve the existing condition (i.e. sheet flow onto Wildes Road and into Hobbs Brook).

The proposed project will result in an increased impervious area of 91,000 square feet.

Low Impact Development Measures

A conventional system of piped catch basins and manholes is proposed to intercept runoff from paved areas of the site. Roof runoff from five of the six buildings is to be directed to bioretention cells (rain gardens). Units 1-4 runoff will be directed to an open infiltration/storage basin.

Standard 1

No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

In the existing condition, runoff flows from the site on various paths to the wetland resource area bordering on Hobbs Brook. The stormwater system is proposed to have several discharge points, so as to not concentrate flow at a particular location and result in an erosive condition. Scour analysis computations are provided for the various discharge points in Section 3 of this document. Non erosive velocities will result, thus satisfying the requirements of Standard 1.

Standard 2

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

Several best management practices are proposed throughout the site to mitigate the effect of runoff increases which result from development. Tables 1-3 summarize the predevelopment and postdevelopment runoff rates and volumes for the six individual catchment areas on site for 2, 10 and 100 year storms, respectively.

Standard 3

Loss of annual recharge to ground water shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type.

All proposed development and redevelopment activities are proposed to occur over Hydrologic B Group soils, for which a recharge volume of 0.35 inches per impervious acre is required. A total new impervious area of 86,775 square feet (1.99 acres) is proposed, which requires a minimum recharge volume of 2,531 cubic feet. The following best management practices are proposed to satisfy Standard 3:

- Bioretention Cells (rain gardens) – roof runoff
- Infiltration Basin
- Infiltration Vaults

Calculations for required and design water quality volumes are provided in Section 3 together with a drawdown analysis. A required recharge volume of 2,531 cubic feet is satisfied by a design water quality volume of 7,860 cubic feet.

Standard 4

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

A variety of stormwater best management standards including deep sump catch basins, water quality inlets, Stormceptors and infiltration BMP's are proposed. Design and impact evaluation for the proposed best management practices are provided in Section Three.

Standard 5

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

Table 1 – 2 Year Storm Analysis

Watersheds	Best Management Practices	Pre Development		Post Development	
		Peak Runoff Rate (cfs)	Runoff Volume (cf)	Peak Runoff Rate (cfs)	Runoff Volume (cf)
I.	Infiltration/Storage Basin	.02	620	.01	202
II.	Area Reduction	.02	189	.01	96
III.	Infiltration/Storage Vaults for roof and deck/patio runoff area reduction	0.87	6,229	0.70	6,011
IV.	Area reduction and minimal surface type change	0.44	2,588	0.41	2,427
V.	See discussion in Stormwater Peak Rate Attenuation Summary	0.15	962	0.23	6,352
VI.	Does not leave site in predevelopment	0.36	2,336	Combined with Watershed VII.	Combined with Watershed VII.
VII.	Area reduction, piped storage basin, infiltration/storage vault	2.04	8,930	1.19	12,069

Table 2 – 10 Year Storm Analysis

Watersheds	Best Management Practices	Pre Development		Post Development	
		Peak Runoff Rate (cfs)	Runoff Volume (cf)	Peak Runoff Rate (cfs)	Runoff Volume (cf)
I.	Infiltration/Storage Basin	.31	3,053	.16	2,315
II.	Area Reduction	.12	670	.06	270
III.	Infiltration/Storage Vaults for roof and deck/patio runoff area reduction	2.87	16,536	2.21	16,986
IV.	Area reduction and minimal surface type change	1.48	6,871	1.38	6,441
V.	See discussion in Stormwater Peak Rate Attenuation Summary	.56	2,705	0.85	13,208
VI.	Does not leave site in predevelopment	1.37	6,569	Combined with Watershed VII.	Combined with Watershed VII.
VII.	Area reduction, piped storage basin, infiltration/storage vault	4.20	17,941	2.95	23,495

Table 3 – 100 Year Storm Analysis

Watersheds	Best Management Practices	Pre Development		Post Development	
		Peak Runoff Rate (cfs)	Runoff Volume (cf)	Peak Runoff Rate (cfs)	Runoff Volume (cf)
I.	Infiltration/Storage Basin	1.25	8,858	.76	8,498
II.	Area Reduction	.37	1,700	.14	610
III.	Infiltration/Storage Vaults for roof and deck/patio runoff area reduction	6.77	36,065	4.96	37,721
IV.	Area reduction and minimal surface type change	3.46	14,985	3.25	14,049
V.	See discussion in Stormwater Peak Rate Attenuation Summary	1.40	6,095	3.07	24,666
VI.	Does not leave site in predevelopment	3.39	14,802	Combined with Watershed VII.	Combined with Watershed VII.
VII.	Area reduction, piped storage basin, infiltration/storage vault	7.64	32,768	7.86	43,046

The new site use is residential and therefore not a land use with higher potential pollutant loads. Redevelopment of the parking lot will improve existing conditions.

Standard 6

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook.

There is an Interim Wellhead Protection Area associated with an existing well adjacent to the second fairway. That well is to be filled and abandoned once Town water is extended to the site, thus eliminating the Interim Wellhead Protection Area.

Standard 7

A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The existing parking lot serving the golf course is to be removed and reconstructed. The runoff from the present lot currently sheet flows onto Wildes Road and into Hobbs Brook with no pretreatment. Runoff from the new parking lot will be captured by deep sump catch basins, routed through a pretreatment device (Stormceptor) and discharged into a swale. The paved area of parking lot serving the golf course will be diminished by some 9,500 square feet.

The proposed stormwater management system for the redeveloped parking lot will meet the requirements of Standards 1, 2, 4, 8, 9 and 10. The impervious area is to be reduced as a LID alternative solution to Standard 3.

Standard 8

A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation and pollution prevention plan) shall be developed and implemented.

A draft copy of the Stormwater Pollution Prevention Plan is provided in Section 4. The plan would be updated as to Project Manager, General Contractor and Subcontractors, Start and Completion Dates once such items have been determined.

Standard 9

A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

An Operation and Maintenance Plan for the stormwater management system is provided in Section 4.

Standard 10

All illicit discharges to the stormwater management system are prohibited.

There are no known illicit discharges existing on site. The new buildings will discharge wastewater to a new on site subsurface sewage disposal system designed in compliance with Title 5 of the Massachusetts State Environmental Code.

SECTION 3
HYDROLOGIC AND HYDRAULIC ANALYSIS

STANDARD 1
SCOUR ANALYSIS

EASTERN LAND SURVEY ASSOCIATES, INC.
Christopher R. Mello PLS
104 Lowell Street
PEABODY, MA 01960
(978) 531-8121

JOB THE MEADOWS - TOPSFIELD
SHEET NO. 1 OF 2
CALCULATED BY JHM DATE 10/08
CHECKED BY [signature] DATE "
SCALE

STANDARD 1 - SCOUR ANALYSIS.

FOR EACH OUTLET, DETERMINE THE VELOCITY AT MAXIMUM OUTFLOW (100 YEAR EVENT) AND COMPARE TO DEP RECOMMENDED VALUES

WATERSHED I - OUTLET TO BASIN ADJACENT TO UNIT 1
100 YEAR OUTFLOW = (.36 CFS - .04 CFS)
= .32 CFS THRU A 12" HDPE S=.005
VELOCITY AT PIPE END << 2.0 CFS
GROUND SLOPE = < 5% MAX. VELOCITY = 5 FPS OK.

WATERSHED II - SHEET FLOW Q2YR = .01 CFS
VELOCITY << 2.0 FPS OK.

WATERSHED III

a. INFILTRATION / STORAGE BASINS - 100 YR QP
= .35 CFS - .04 CFS = .31 CFS
THROUGH 6" PIPE S=.01
VELOCITY = 3.1 FPS @ .61 CFS
ACTUAL VELOCITY = 3.1 FPS < 5 FPS OK

b. OVERLAND (SHEET FLOW) 2 YEAR FLOW = .44 CFS. OK

WATERSHED IV

OUTFLOW FROM STORMCEPTOR - 100 YR. Q = 1.16 CFS.
12" OUTFLOW - S = 0.010 CAPACITY = 3.56 CFS @ V = 4.54 FPS
ACTUAL VELOCITY = 3.9 FPS < 5 FPS OK.

EASTERN LAND SURVEY ASSOCIATES, INC.
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CALCULATED BY JHM DATE 10/08
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SCALE

WATERSHED V - OUTLET TO VAULT ON FIRST FAIRWAY
100 YEAR OUTFLOW = 1.98 CFS THROUGH 12" HDPE S=0.01
CAPACITY = 3.96 CFS @ 4.91 FPS - OUTLET VELOCITY = 4.9 CFS.

PROVIDE RIPRAP LEVEL SPREADER FOR VELOCITY REDUCTION AT PIPE END (SEE SITE PLAN SHEET 7).

WATERSHED VI + VII

100 YEAR PEAK RUNOFF RATE = 7.86 CFS

DISCHARGE INTO A 3' WIDE GRASS CHANNEL WITH 2:1 SIDE SLOPES, LONGITUDINAL SLOPE OF 1.5%.

FLOW DEPTH = .5' VELOCITY = 4.0 FPS OK
(MANNING n = 0.024)

STANDARD 2
PEAK RATE ATTENUATION ANALYSIS

Stormwater Peak Rate Attenuation Summary

The stormwater peak runoff rates and volumes have been analyzed for 2, 10 and 100 year storm events in the predevelopment and postdevelopment condition. The analysis has been done utilizing TR-55 methodology under a computer simulation known as Hydraflow. It is to be noted that one characteristic of the program is that it does not plot diversion hydrographs. If such are needed by a review authority, they can be provided in a tabular format. The various subwatershed analyses are summarized in Tables 1, 2 and 3, and in a narrative manner as follows.

Watershed I. (Pages 3-1 – 3-12)

This watershed comprises the southwest portion of the development site and discharges to a wetland resource area between the second green and third tee. Runoff rates are to be controlled by means of an open infiltration/storage basin adjacent to Unit 1. That basin (as is the case with other such best management practices on site) relies primarily on infiltration for the 2 year storm event and storage in the upper portion of the basin for 10 and 100 year storm events.

Watershed II. (Pages 3-13 – 3-14)

This is a relatively small area of the site draining to Wildes Road. Rates are reduced in the proposed condition as a result of regrading of portions of the watershed such that area reduction occurs.

Watershed III. (Pages 3-15 – 3-21)

Watershed III. is comprised of the west portion of the site which is tributary to the second fairway and the pond near the second tee. Runoff rates are reduced as a result, in part, of regrading and resultant area reduction and, in part, infiltration/storage vaults for the three buildings containing Units 5-16, inclusive. Those vaults will receive the majority of roof runoff (no volume credit is taken for that portion tributary to the bioretention cells) and the runoff from patio/deck areas on the fairway side of the buildings.

Watershed IV. (Pages 3-22 – 3-23)

Watershed IV. is in the northerly portion of the development site and is tributary to a wetland resource area between the first and second fairways. A slight runoff reduction results from minimal alteration of surface area characteristics and a slight area reduction.

Watershed V. (Pages 3-24 – 3-33)

Watershed V. is in the northeasterly portion of the development site and flows overland into the first fairway. Runoff toward the first fairway will actually increase as a result of watershed alterations, especially with Watershed III. Increases in peak runoff rate of .08 cfs (2 year), .29 cfs (10 year) and 1.67 cfs (100 year) are projected. The ultimate discharge point of that runoff is the pond on the seventh fairway. The rate reductions of .17 cfs (2 year), .66 cfs (10 year) and 1.81 cfs (100 year) for Watershed III will result in unchanged characteristics in the resource area adjacent to Hobbs Brook.

Watershed VI. (Pages 3-34 and 3-36 – 3-45)

Watershed VI. is in the vicinity of the existing practice green and is a natural depression with no visible outlet. Runoff rarely puddles in the area due to very permeable soils below grade.

In the proposed condition, much of Watershed VI. is to be used for the leach beds. Runoff will therefore be directed to Watershed VII. and Hobbs Brook in such a manner as to not increase peak runoff rates in 2 or 10 year storms nor affect offsite flooding in the 100 year event.

Watershed VII. (Pages 3-35 – 3-45)

Watershed VII. consists of the parking lot, a wooded area west of the parking lot and the vicinity of the Clubhouse and the first tee in the existing condition. A newly designed more geometrically efficient parking lot will drain into a group of 36 inch diameter storage pipes to be located under the reconstructed practice green. The combined outflow of the storage pipes and other tributary areas will be less than the existing sheet flow from the parking lot in 2 and 10 year storms. The 100 year peak rate will increase slightly (.24 cfs) but is not expected to impact present flooding characteristics of Hobbs Brook. (The site is in the lower reach of the watershed and will tend to attain peak discharge before the remainder of the watershed does.

Table 1 – 2 Year Storm Analysis

Watersheds	Best Management Practices	Pre Development		Post Development	
		Peak Runoff Rate (cfs)	Runoff Volume (cf)	Peak Runoff Rate (cfs)	Runoff Volume (cf)
I.	Infiltration/Storage Basin	.02	620	.01	202
II.	Area Reduction	.02	189	.01	96
III.	Infiltration/Storage Vaults for roof and deck/patio runoff area reduction	0.87	6,229	0.70	6,011
IV.	Area reduction and minimal surface type change	0.44	2,588	0.41	2,427
V.	See discussion in Stormwater Peak Rate Attenuation Summary	0.15	962	0.23	6,352
VI.	Does not leave site in predevelopment	0.36	2,336	Combined with Watershed VII.	Combined with Watershed VII.
VII.	Area reduction, piped storage basin, infiltration/storage vault	2.04	8,930	1.19	12,069

Table 2 – 10 Year Storm Analysis

Watersheds	Best Management Practices	Pre Development		Post Development	
		Peak Runoff Rate (cfs)	Runoff Volume (cf)	Peak Runoff Rate (cfs)	Runoff Volume (cf)
I.	Infiltration/Storage Basin	.31	3,053	.16	2,315
II.	Area Reduction	.12	670	.06	270
III.	Infiltration/Storage Vaults for roof and deck/patio runoff area reduction	2.87	16,536	2.21	16,986
IV.	Area reduction and minimal surface type change	1.48	6,871	1.38	6,441
V.	See discussion in Stormwater Peak Rate Attenuation Summary	.56	2,705	0.85	13,208
VI.	Does not leave site in predevelopment	1.37	6,569	Combined with Watershed VII.	Combined with Watershed VII.
VII.	Area reduction, piped storage basin, infiltration/storage vault	4.20	17,941	2.95	23,495

Table 3 – 100 Year Storm Analysis

Watersheds	Best Management Practices	Pre Development		Post Development	
		Peak Runoff Rate (cfs)	Runoff Volume (cf)	Peak Runoff Rate (cfs)	Runoff Volume (cf)
I.	Infiltration/Storage Basin	1.25	8,858	.76	8,498
II.	Area Reduction	.37	1,700	.14	610
III.	Infiltration/Storage Vaults for roof and deck/patio runoff area reduction	6.77	36,065	4.96	37,721
IV.	Area reduction and minimal surface type change	3.46	14,985	3.25	14,049
V.	See discussion in Stormwater Peak Rate Attenuation Summary	1.40	6,095	3.07	24,666
VI.	Does not leave site in predevelopment	3.39	14,802	Combined with Watershed VII.	Combined with Watershed VII.
VII.	Area reduction, piped storage basin, infiltration/storage vault	7.64	32,768	7.86	43,046

RUNOFF CURVE NUMBERS

EASTERN LAND SURVEY ASSOCIATES, INC.
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PEABODY, MA 01960
(978) 531-8121

JOB NEW MEADOWS - TOPSFIELD.
SHEET NO. _____ OF _____
CALCULATED BY JHM DATE 8/08
CHECKED BY _____ DATE _____
SCALE _____

RUNOFF CURVE NUMBER CALCULATIONS
PREDEVELOPMENT CONDITIONS

WATERSHED I: 1.52 ACRES
IMPERVIOUS CN 98 = .13 Ac. WOODED HSG B 0.49 Ac
WOODED HSG A: 0.6 Ac OPEN SPACE HSG B 0.3 Ac

$$CN = \frac{.13 \times 98 + .6 \times 30 + .49 \times 55 + .3 \times 61}{1.52} = 75.99 / 1.52$$

= 49.99, USE 50

WATERSHED II .25 Ac HSG B, WOODED CN = 55

WATERSHED III 3.61 Ac, ALL HSG B
.16 Ac IMPERVIOUS 3.45 Ac OPEN SPACE.
CN = 226.13 / 3.61 = 62.64, USE 63

WATERSHED IV - 1.6 Ac, ALL HSG B
.25 Ac IMPERVIOUS .9 Ac WOODED. .45 Ac OPEN SPACE
CN = 101.45 / 1.6 = 63.40, USE 64

WATERSHED VI - 1.7 Ac, ALL HSG B
.06 Ac IMPERVIOUS 1.64 Ac. OPEN SPACE
CN = 10 /1. = 62.3

WATERSHED VII 2.3 Ac, ALL HSG B
1.0 Ac IMPERVIOUS, 1.1 Ac OPEN SPACE, 0.2 Ac. WOODED.
CN = 176.1 / 2.3 = 76.56, USE 77.

WATERSHED V AREA = 0.70 Ac. ALL OPEN SPACE CN = 61

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SHEET NO. 1 OF 2
CALCULATED BY JHM DATE 10/08
CHECKED BY _____ DATE _____
SCALE _____

RUNOFF CURVE NUMBER CALCULATIONS
POST DEVELOPMENT CONDITIONS

PROPOSED WATERSHED I

a. AREA TO INFILTR./STORAGE BASIN @ UNIT 1 1.22 Ac.
HSG A: OPEN SPACE .25 Ac WOODED .06 Ac.
HSG B: OPEN SPACE = .43 Ac IMP. = .48 Ac.
CN = 69.52, USE 70

b. OVERLAND: .75 Ac.
HSG A: OPEN SPACE .25 Ac WOODED .17 Ac.
HSG B: OPEN SPACE: .15 Ac WOODED: .20 Ac.
PATIO (USE CN 80) .03 Ac.
CN = 45.45, USE 45.

PROPOSED WATERSHED II

.07 Ac HSG B, OPEN SPACE CN = 61

PROPOSED WATERSHED III

OVERLOAD a. 2.45 Ac, HSG B, OPEN SPACE CN = 61.

b. ROOF/PATIO AREA. .23 Ac.
.19 Ac - CN 98 (ROOF). .04 Ac. PATIO CN = 80
CN = 94.86, USE 95

PROPOSED WATERSHED IV

1.50 Ac, HSG B
WOODED; .9 Ac; IMPERVIOUS; .23 Ac; OPEN SPACE: .37 Ac.
CN = 63.07, USE 63

PROPOSED WATERSHED V (HSG B)

a. OVERLAND: 0.56 Ac OPEN SPACE, CN: 61
b. TO INFILTR/STORAGE VAULT D: .23 Ac CN 95 (AS WAS CALCULATED FOR WS III b)
c. TO VAULT IN FIRST FAIRWAY FROM CBSW'S @ 4+90
1.10 Ac. Imp. = .63 Ac OPEN SPACE = .47 Ac.
CN = 82.19 USE 82.

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CALCULATED BY JHM DATE 10/02
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PROPOSED WATERSHED VI (HSG B)

a. OVERLAND 1.54 Ac IMPERVIOUS .05 Ac OPEN SPACE 1.49 Ac
CN = 62.20 USE 63.

b. INFILT./STORAGE BASIN E: .23 Ac CN 95 AS WITH OTHER BASINS.

PROPOSED WATERSHED VII (HSG B)

a. OVERLAND PORTION .85 Ac
.20 Ac WOODED, .12 Ac. IMPERVIOUS, .53 Ac OPEN SP.
CN = 64.81, USE 65.

b. PARKING LOT PORTION TO STORAGE PIPES: .75 Ac.
.65 Ac IMPERVIOUS, .10 Ac. OPEN SPACE.
CN = 93.07, USE 93

COMPARISON & SUMMARY OF AREAS
PREDEVELOPMENT / POSTDEVELOPMENT WATERSHEDS

WATERSHED	AREA. PREDEVELOPMENT	POSTDEVELOPMENT.
I	1.52	1.97.
II	0.35	.07.
III	3.61	3.14
IV	1.6	1.50
V	0.7	1.89
VI	1.7	1.78
VII	2.3	1.60
TOTAL.	11.68	11.68 OK

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

WS I Existing
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.410
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 1.0 %
Travel Time	**= 29.4 min**

Shallow Concentrated Flow

Flow length	= 110 ft
Watercourse slope	= 2.0 %
Surface description	= Unpaved
Average velocity	= 2.28 ft/s
Travel Time	**= 0.8 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc ..... **= 30.2 min**

Hydrograph Plot

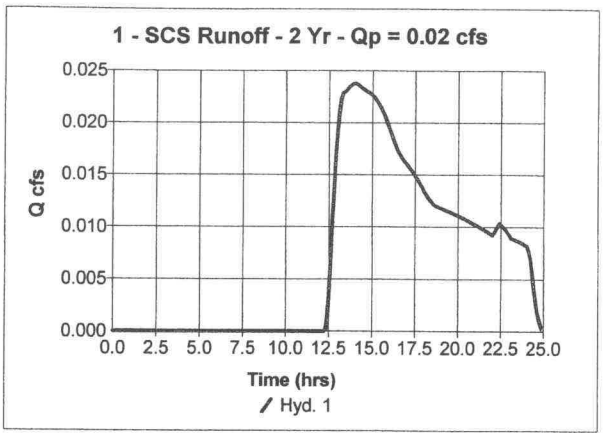
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

WS I Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 0.02 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 1.52 ac	Curve number	= 50
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 30.2 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 620 cuft



Hydrograph Plot

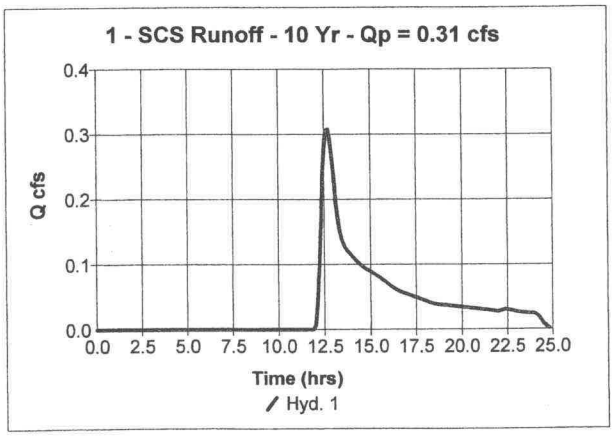
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

WS I Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 0.31 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 1.52 ac	Curve number	= 50
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 30.2 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,053 cuft



Hydrograph Plot

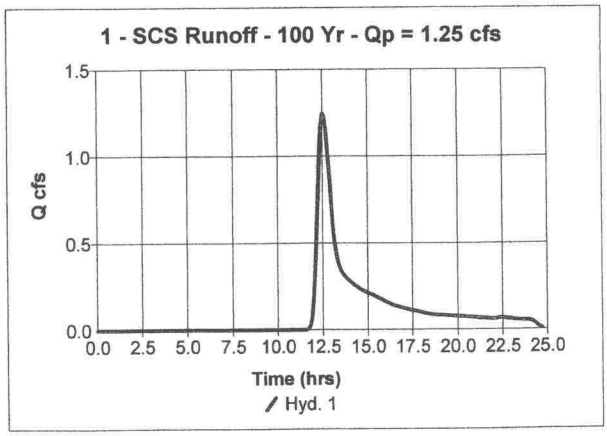
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

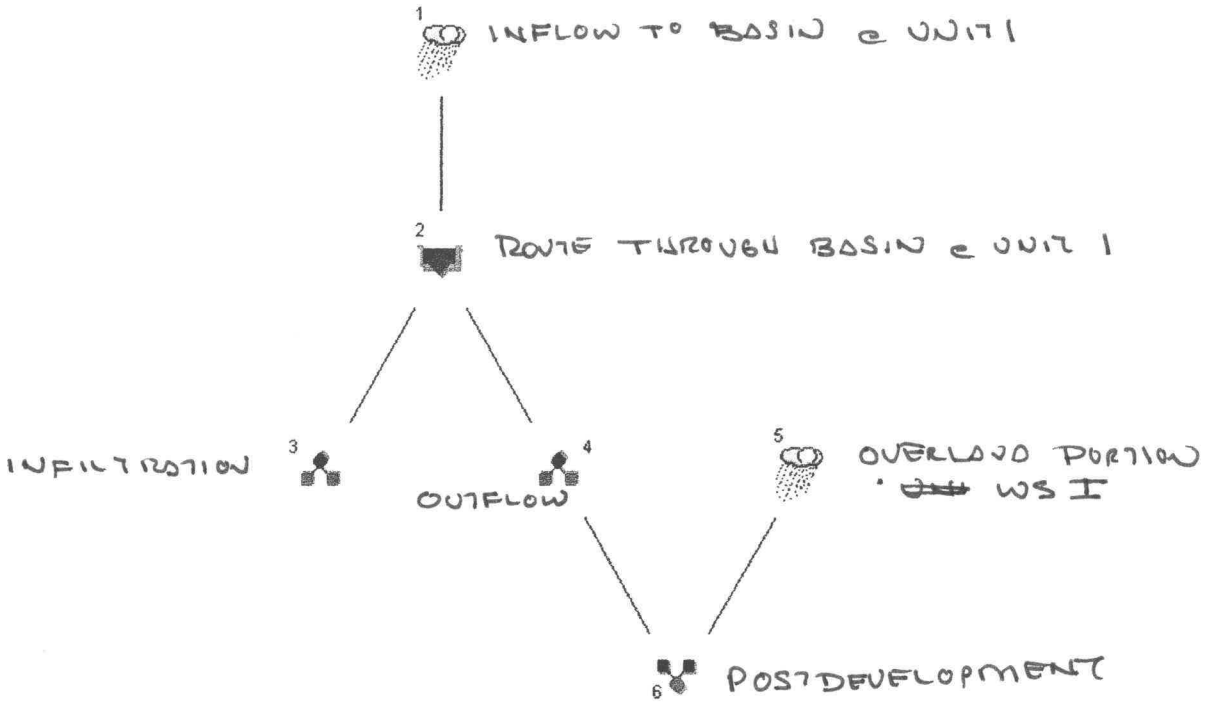
WS I Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 1.25 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 1.52 ac	Curve number	= 50
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 30.2 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 8,858 cuft



WATERSHED 1
PREDEVELOPMENT



WATERSHED I
POSTDEVELOPMENT

Hydraflow Hydrographs Diagram	Project: NM WS I.gpw	10-23-2008

Hydrograph Plot

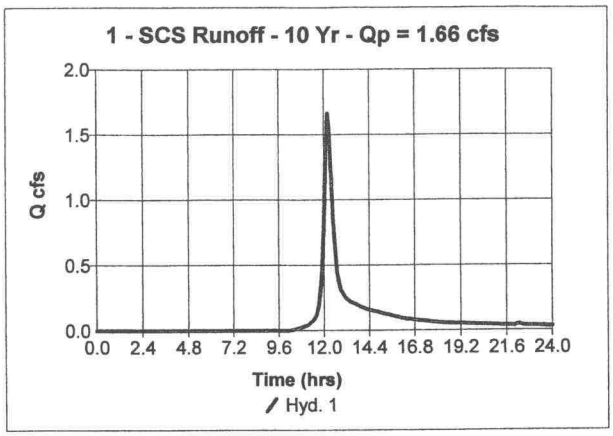
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

INFLOW TO BASIN UNIT 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.66 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 1.22 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.7 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 7,244 cuft



Hydrograph Plot

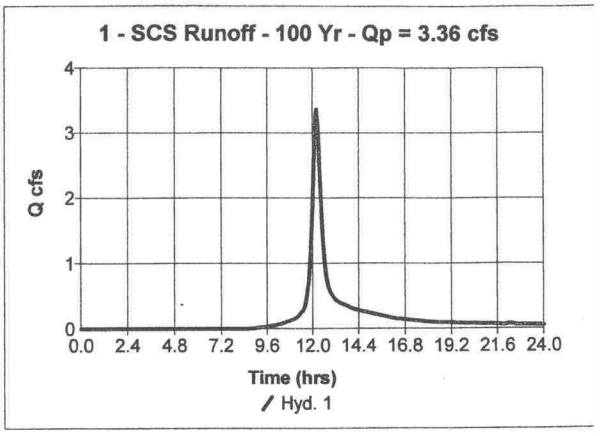
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

INFLOW TO BASIN UNIT 1

Hydrograph type	= SCS Runoff	Peak discharge	= 3.36 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 1.22 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.7 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 14,336 cuf



Hydrograph Plot

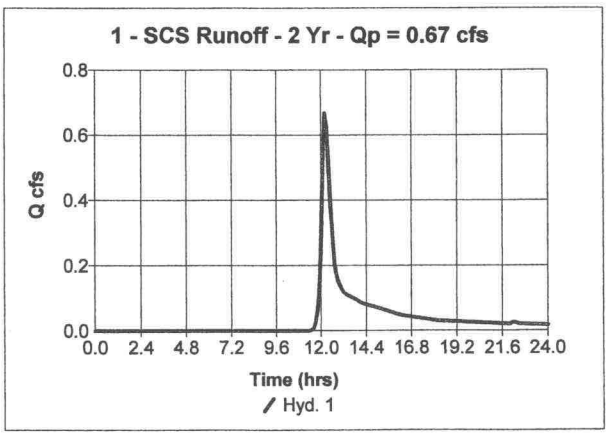
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

INFLOW TO BASIN UNIT 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.67 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 1.22 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.7 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,199 cuft



TR55 Tc Worksheet

Hyd. No. 1

INFLOW TO BASIN UNIT 1
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.240
Flow length	= 60.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 1.0 %
Travel Time	**= 12.7 min**

Shallow Concentrated Flow

Flow length	= 105 ft
Watercourse slope	= 0.7 %
Surface description	= Paved
Average velocity	= 1.70 ft/s
Travel Time	**= 1.0 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc ..... **= 13.7 min**

Reservoir Report

Reservoir No. 1 - UNIT 1 BASIN

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	60.00	4,000	0	0
2.00	62.00	5,960	9,960	9,960
3.00	63.00	7,600	6,780	16,740

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 12.0	3.0	6.0	0.0
Span in	= 12.0	3.0	6.0	0.0
No. Barrels	= 1	1	1	0
Invert El. ft	= 60.50	60.50	61.75	0.00
Length ft	= 65.0	1.0	1.0	0.0
Slope %	= 0.50	0.50	0.50	0.00
N-Value	= .013	.013	.013	.000
Orif. Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 2.40 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	60.00	0.00	0.00	0.00	---	---	---	---	---	0.000	0.00
2.00	9,960	62.00	0.44	0.26	0.17	---	---	---	---	---	0.000	0.76
3.00	16,740	63.00	1.27	0.33	0.95	---	---	---	---	---	0.000	1.69

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

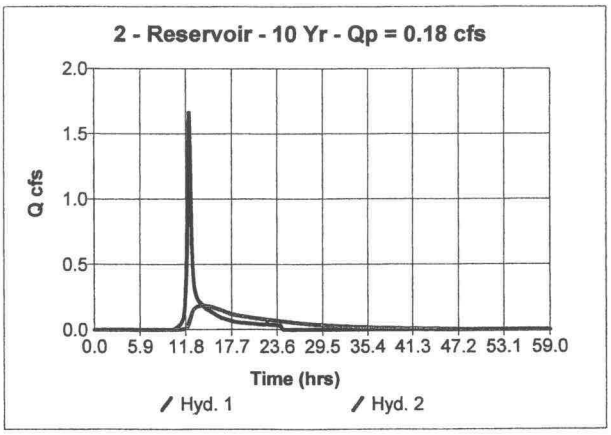
Hyd. No. 2

ROUTE THRU BASIN U.1

Hydrograph type	= Reservoir	Peak discharge	= 0.18 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyd. No.	= 1	Reservoir name	= UNIT 1 BASIN
Max. Elevation	= 60.73 ft	Max. Storage	= 3,612 cuft

Storage indication method used.

Hydrograph Volume = 7,215 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

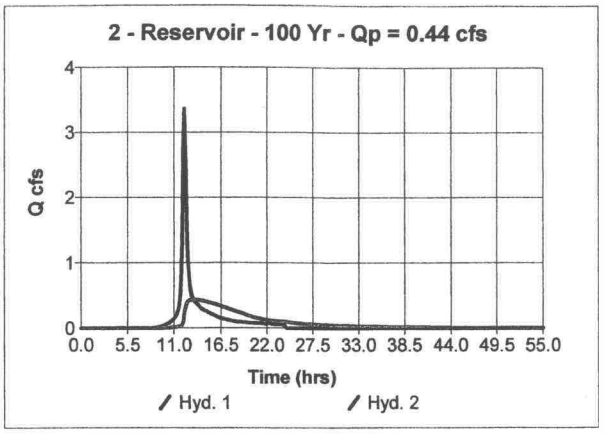
Hyd. No. 2

ROUTE THRU BASIN U.1

Hydrograph type	= Reservoir	Peak discharge	= 0.44 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyd. No.	= 1	Reservoir name	= UNIT 1 BASIN
Max. Elevation	= 61.43 ft	Max. Storage	= 7,127 cuft

Storage indication method used.

Hydrograph Volume = 14,305 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

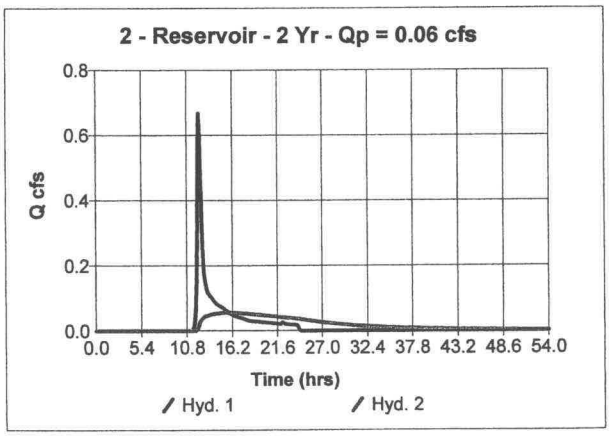
Hyd. No. 2

ROUTE THRU BASIN U.1

Hydrograph type	= Reservoir	Peak discharge	= 0.06 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyd. No.	= 1	Reservoir name	= UNIT 1 BASIN
Max. Elevation	= 60.34 ft	Max. Storage	= 1,686 cuft

Storage indication method used.

Hydrograph Volume = 3,169 cuft



TR55 Tc Worksheet

Hyd. No. 5

I Post Overland
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.400
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 1.2 %
Travel Time	**= 26.8 min**

Shallow Concentrated Flow

Flow length	= 130 ft
Watercourse slope	= 1.0 %
Surface description	= Unpaved
Average velocity	= 1.61 ft/s
Travel Time	**= 1.3 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc ..... **= 28.1 min**

Hydrograph Plot

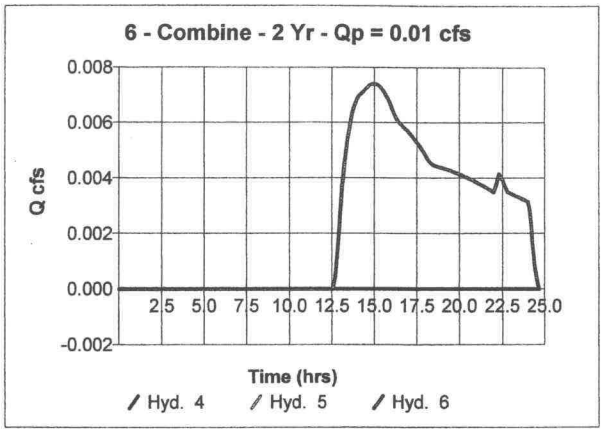
Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

Postdev. WS I

Hydrograph type	= Combine	Peak discharge	= 0.01 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyds.	= 4, 5		

Hydrograph Volume = 202 cuft



Hydrograph Plot

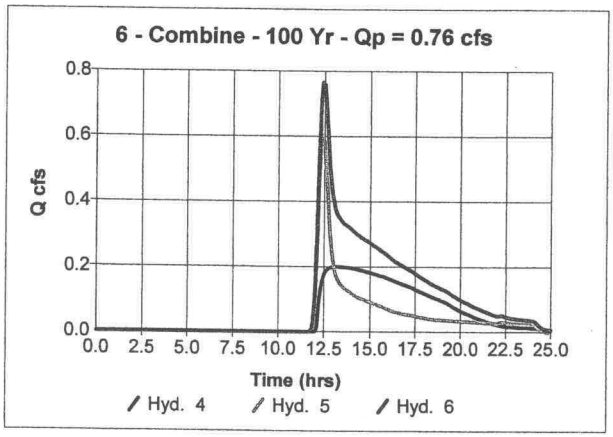
Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

Postdev. WS I

Hydrograph type	= Combine	Peak discharge	= 0.76 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 4, 5		

Hydrograph Volume = 8,498 cuft



Hydrograph Plot

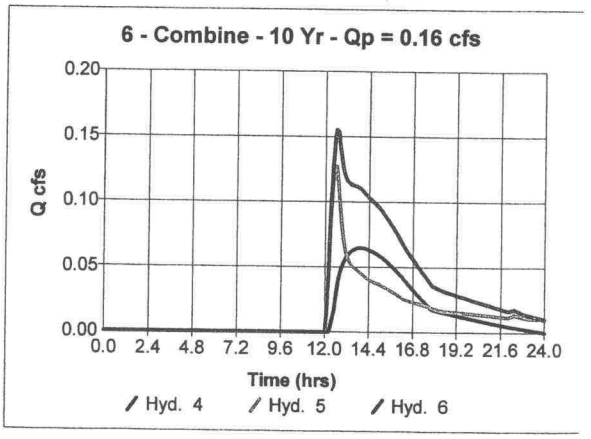
Hydraflow Hydrographs by Intelis

Hyd. No. 6

Postdev. WS I

Hydrograph type	= Combine	Peak discharge	= 0.16 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyds.	= 4, 5		

Hydrograph Volume = 2,315



Hydrograph Plot

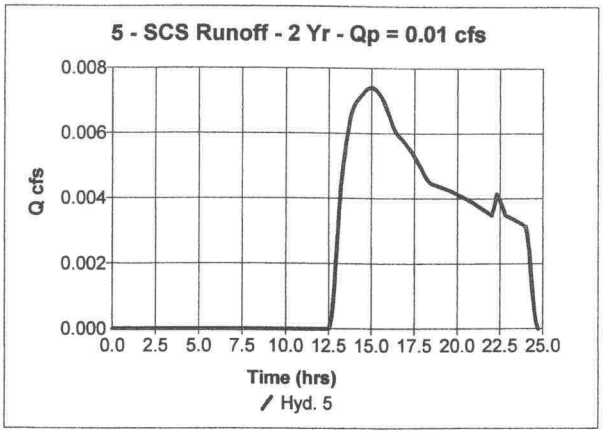
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

I Post Overland

Hydrograph type	= SCS Runoff	Peak discharge	= 0.01 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 0.75 ac	Curve number	= 48
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 28.1 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 202 cuft



Hydrograph Plot

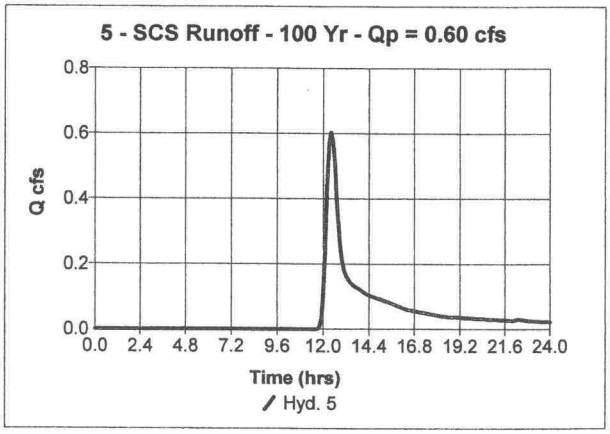
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

I Post Overland

Hydrograph type	= SCS Runoff	Peak discharge	= 0.60 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 0.75 ac	Curve number	= 48
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 28.1 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,779 cuft



Hydrograph Plot

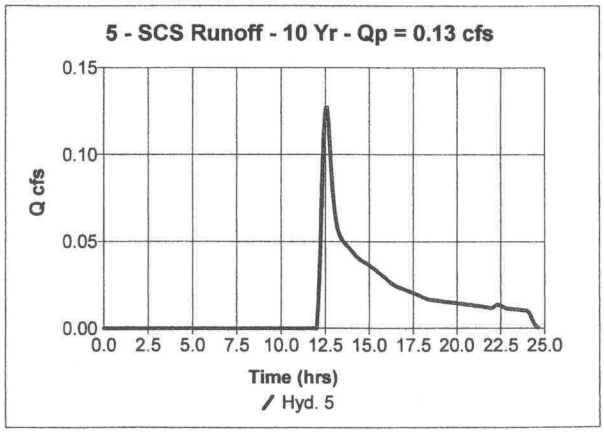
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

I Post Overland

Hydrograph type	= SCS Runoff	Peak discharge	= 0.13 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 0.75 ac	Curve number	= 48
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 28.1 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,215 cuft



WATERSHED I

POSTDEVELOPMENT

Hydrograph Plot

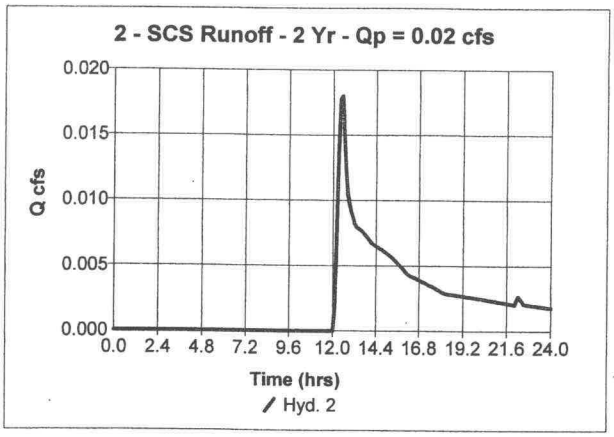
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

WS II Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 0.02 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 0.25 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.9 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 189 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

WS II Existing
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.410
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 4.0 %
Travel Time	**= 16.9 min**

Shallow Concentrated Flow

Flow length	= 0 ft
Watercourse slope	= 0.0 %
Surface description	= Unpaved
Average velocity	= 0.00 ft/s
Travel Time	**= 0.0 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.000
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc ..... **= 16.9 min**

Hydrograph Plot

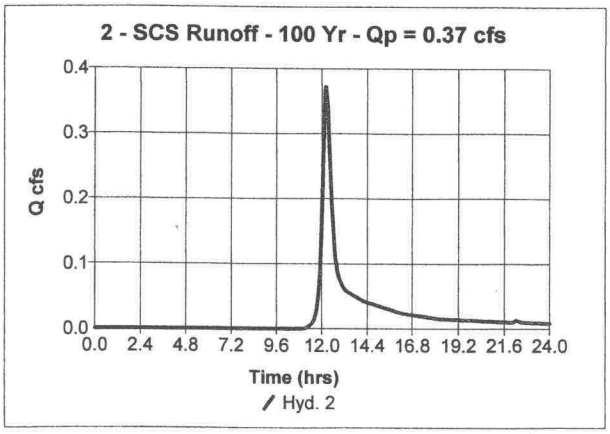
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

WS II Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 0.37 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 0.25 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.9 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,700 cuft



Hydrograph Plot

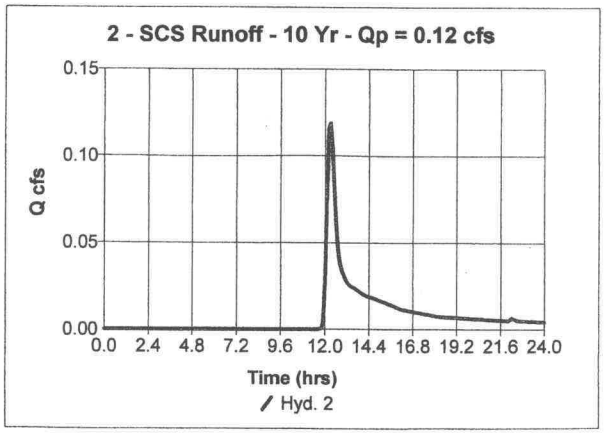
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

WS II Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 0.12 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 0.25 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.9 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 670 cuft



WATERSHED II
PREDEVELOPMENT

Hydrograph Plot

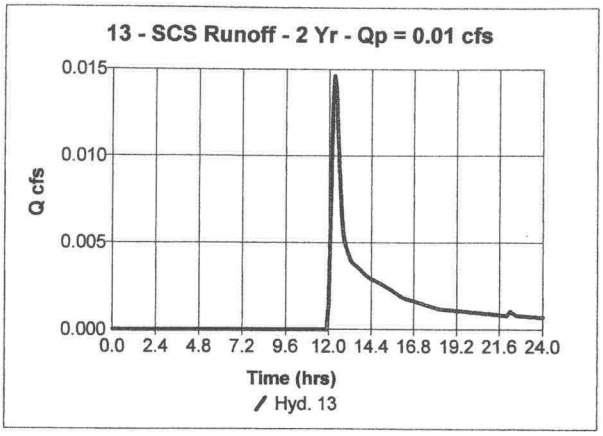
Hydraflow Hydrographs by Intelisolve

Hyd. No. 13

PROP. WS II

Hydrograph type	= SCS Runoff	Peak discharge	= 0.01 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 0.07 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 96 cuft



Hydrograph Plot

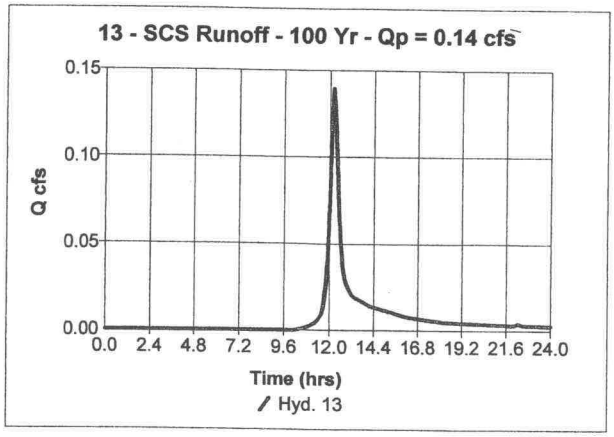
Hydraflow Hydrographs by Intelisolve

Hyd. No. 13

PROP. WS II

Hydrograph type	= SCS Runoff	Peak discharge	= 0.14 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 0.07 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 610 cuft



Hydrograph Plot

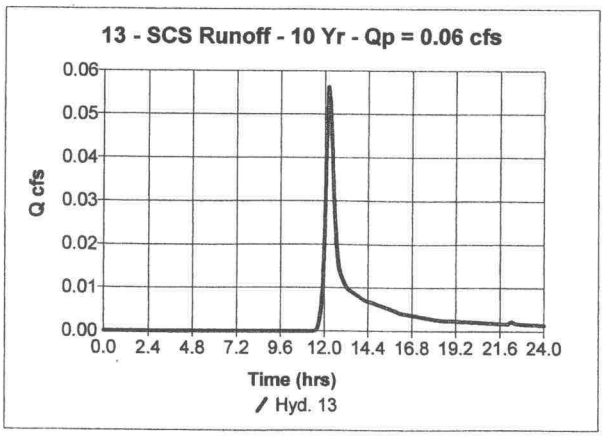
Hydraflow Hydrographs by Intelisolve

Hyd. No. 13

PROP. WS II

Hydrograph type	= SCS Runoff	Peak discharge	= 0.06 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 0.07 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 270 cuft



WATERSHED II
POST DEVELOPMENT

TR55 Tc Worksheet

Hyd. No. 3

WS III Existing
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.400
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 2.0 %
Travel Time	**= 21.8 min**

Shallow Concentrated Flow

Flow length	= 170 ft
Watercourse slope	= 7.5 %
Surface description	= Unpaved
Average velocity	= 4.42 ft/s
Travel Time	**= 0.6 min**

Channel Flow

Cross section flow area	= 28.0 sqft
Wetted perimeter	= 38.0 ft
Channel slope	= 1.0 %
Manning's n-value	= 0.025
Velocity	= 4.86 ft/s
Flow length	= 400.0 ft
Travel Time	**= 1.4 min**

Total Travel Time, Tc **= 23.8 min**

Hydrograph Plot

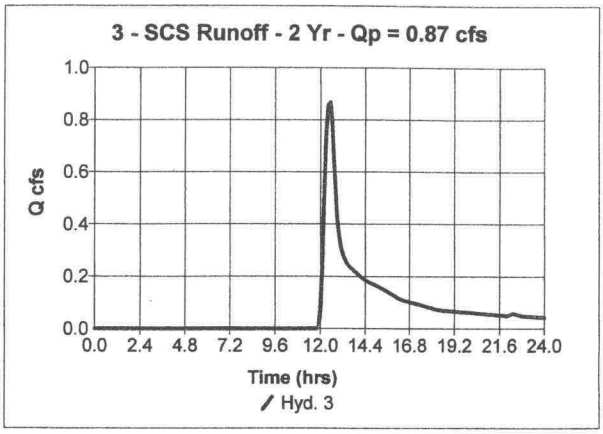
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

WS III Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 0.87 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 3.61 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.8 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6,229 cuft



Hydrograph Plot

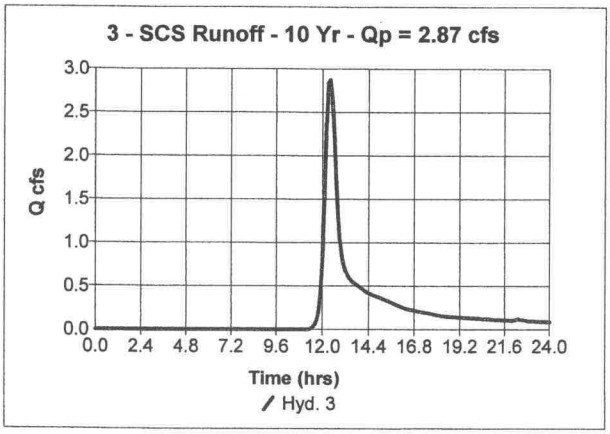
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

WS III Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 2.87 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 3.61 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.8 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 16,536 cuft



Hydrograph Plot

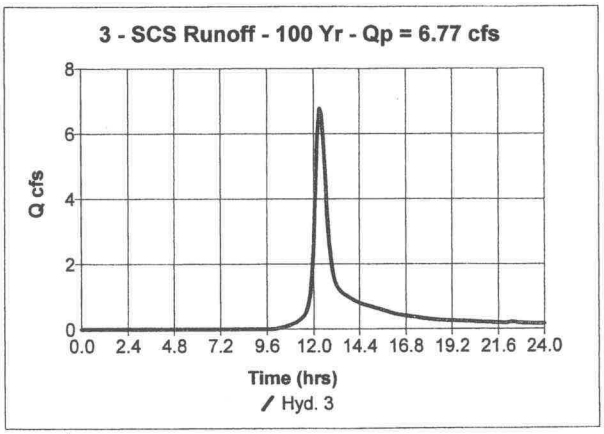
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

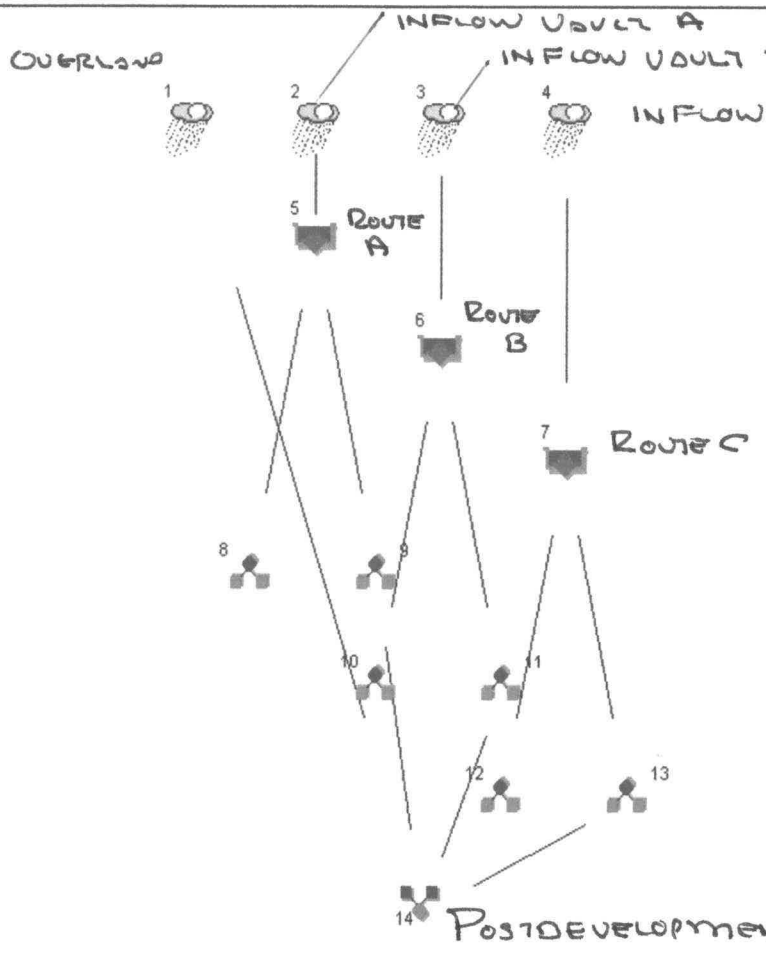
WS III Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 6.77 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 3.61 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.8 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 36,065 cuft



WATERSHED III
PREDEVELOPMENT



HYDROGRAPHS 8, 10 & 12 ARE INFILTRATION.

HYDROGRAPHS 9, 11 AND 13 ARE OUTFLOW

WATERSHED III
POSTDEVELOPMENT

Hydraflow Hydrographs Diagram	Project: NM WS III.gpw	10-24-2008

Hydrograph Plot

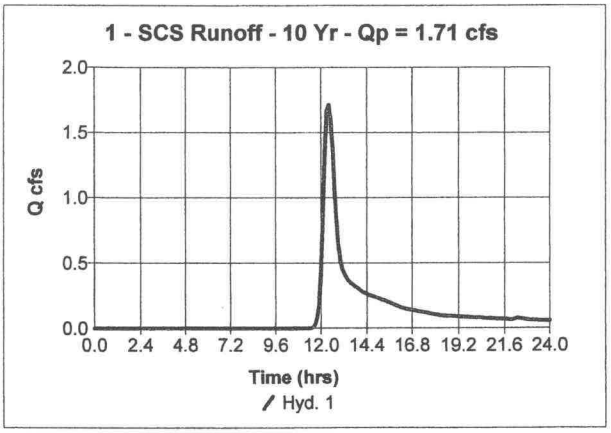
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

PROPOSED WS III OVERLAND

Hydrograph type	= SCS Runoff	Peak discharge	= 1.71 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 2.45 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 23.8 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 10,099 cuft



Hydrograph Plot

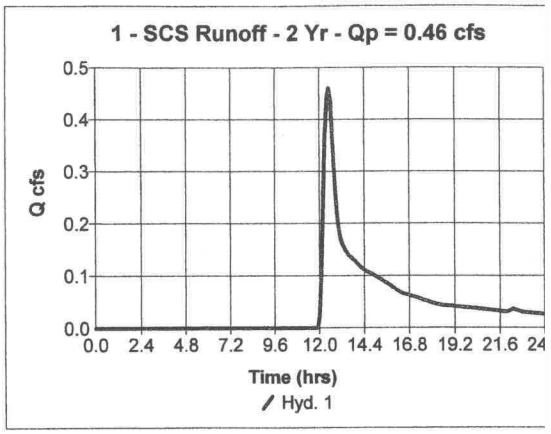
Hydraflow Hydrographs b

Hyd. No. 1

PROPOSED WS III OVERLAND

Hydrograph type	= SCS Runoff	Peak discharge	= 0.46 cf
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 2.45 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 23.8 n
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume



Hydrograph Plot

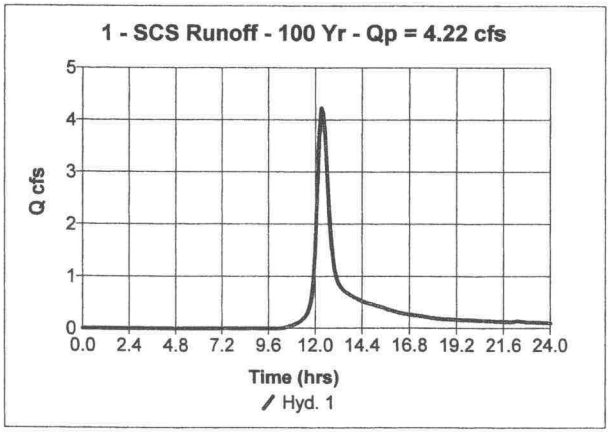
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

PROPOSED WS III OVERLAND

Hydrograph type	= SCS Runoff	Peak discharge	= 4.22 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 2.45 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 23.8 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 22,755 cuft



Hydrograph Plot

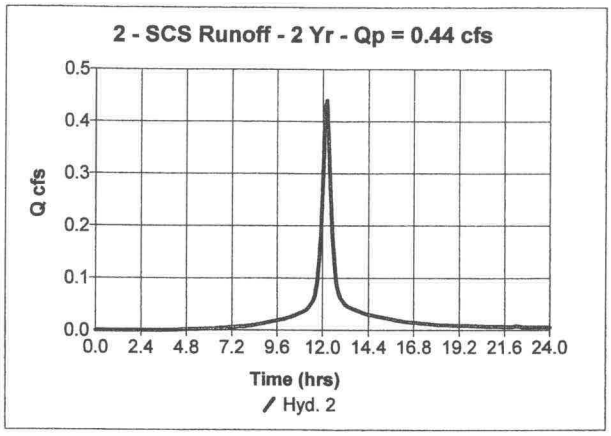
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

INFLOW VAULT A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.44 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 0.23 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,994 cuft



Hydrograph Plot

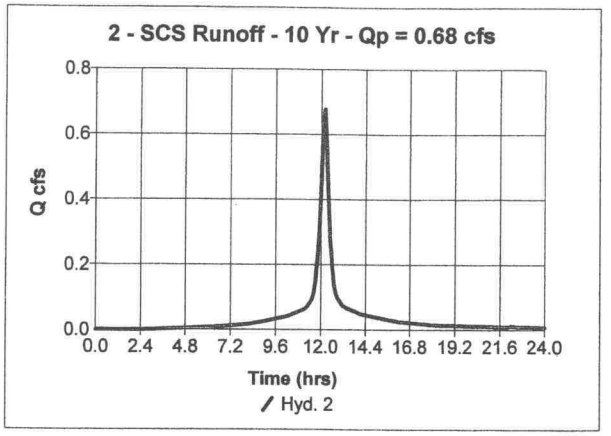
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

INFLOW VAULT A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.68 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 0.23 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,149 cuft



INFLOW IS SAME FOR ALL VAULTS

Hydrograph Plot

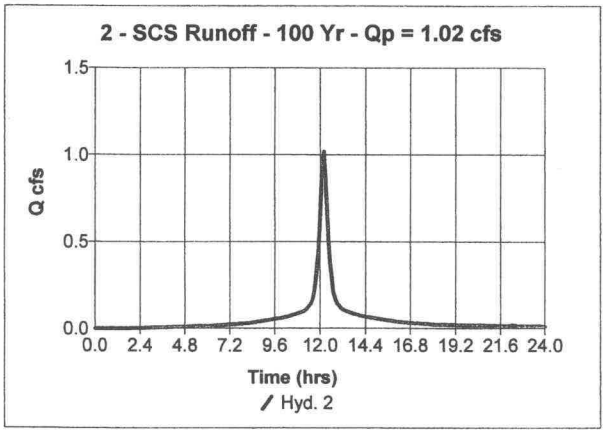
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

INFLOW VAULT A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.02 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 0.23 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4,858 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

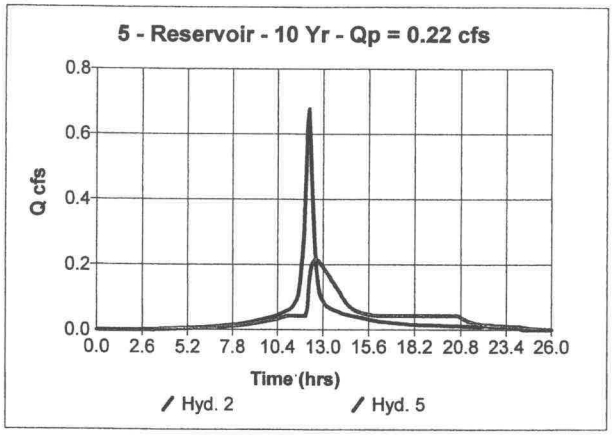
Hyd. No. 5

ROTE THRU VAULT A

Hydrograph type	= Reservoir	Peak discharge	= 0.22 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyd. No.	= 2	Reservoir name	= VAULT A
Max. Elevation	= 101.48 ft	Max. Storage	= 1,158 cuft

Storage indication method used.

Hydrograph Volume = 3,146 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

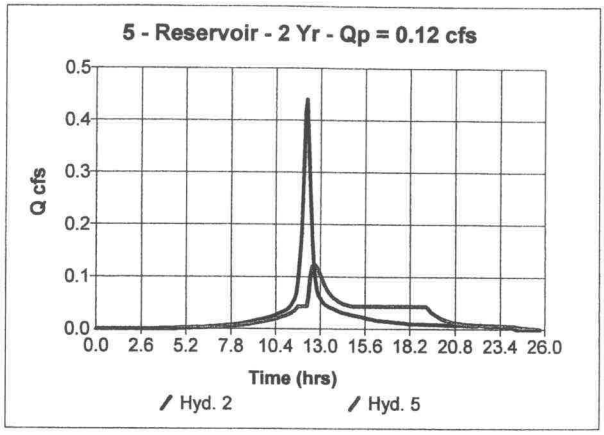
Hyd. No. 5

ROTE THRU VAULT A

Hydrograph type	= Reservoir	Peak discharge	= 0.12 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyd. No.	= 2	Reservoir name	= VAULT A
Max. Elevation	= 100.98 ft	Max. Storage	= 765 cuft

Storage indication method used.

Hydrograph Volume = 1,991 cuft



ROUTING IS SAME FOR ALL VAULTS (ELEVATIONS ON ASSUMED DATUM).

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

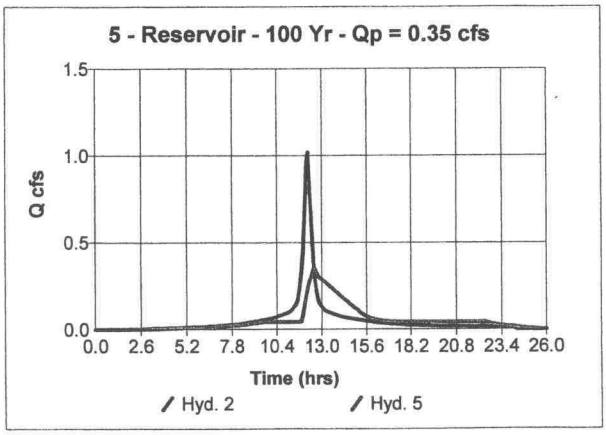
Hyd. No. 5

ROTE THRU VAULT A

Hydrograph type	= Reservoir	Peak discharge	= 0.35 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyd. No.	= 2	Reservoir name	= VAULT A
Max. Elevation	= 102.31 ft	Max. Storage	= 1,804 cuft

Storage indication method used.

Hydrograph Volume = 4,855 cuft



Reservoir Report

SAME FOR ALL VAULTS (ELEVATIONS ON ASSUMED DATUM)

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - STOR/INFILT. VAULT

Pond Data

Bottom LxW = 78.0 x 10.0 ft Side slope = 0.0:1 Bottom elev. = 100.00 ft Depth = 3.20 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	780	0	0
0.16	100.16	780	125	125
0.32	100.32	780	125	250
0.48	100.48	780	125	374
0.64	100.64	780	125	499
0.80	100.80	780	125	624
0.96	100.96	780	125	749
1.12	101.12	780	125	874
1.28	101.28	780	125	998
1.44	101.44	780	125	1,123
1.60	101.60	780	125	1,248
1.76	101.76	780	125	1,373
1.92	101.92	780	125	1,498
2.08	102.08	780	125	1,622
2.24	102.24	780	125	1,747
2.40	102.40	780	125	1,872
2.56	102.56	780	125	1,997
2.72	102.72	780	125	2,122
2.88	102.88	780	125	2,246
3.04	103.04	780	125	2,371
3.20	103.20	780	125	2,496

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 6.0	3.0	6.0	0.0
Span in	= 6.0	3.0	6.0	0.0
No. Barrels	= 1	1	1	0
Invert El. ft	= 100.70	100.70	102.20	0.00
Length ft	= 50.0	1.0	0.0	0.0
Slope %	= 1.00	0.50	0.00	0.00
N-Value	= .013	.013	.013	.000
Orif. Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 2.40 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	---	---	---	---	0.000	0.00
0.16	125	100.16	0.00	0.00	0.00	---	---	---	---	---	0.043	0.04
0.32	250	100.32	0.00	0.00	0.00	---	---	---	---	---	0.043	0.04
0.48	374	100.48	0.00	0.00	0.00	---	---	---	---	---	0.043	0.04
0.64	499	100.64	0.00	0.00	0.00	---	---	---	---	---	0.043	0.04
0.80	624	100.80	0.02	0.02	0.00	---	---	---	---	---	0.043	0.06
0.96	749	100.96	0.07	0.07	0.00	---	---	---	---	---	0.043	0.12
1.12	874	101.12	0.11	0.11	0.00	---	---	---	---	---	0.043	0.15
1.28	998	101.28	0.14	0.14	0.00	---	---	---	---	---	0.043	0.18
1.44	1,123	101.44	0.17	0.17	0.00	---	---	---	---	---	0.043	0.21
1.60	1,248	101.60	0.19	0.19	0.00	---	---	---	---	---	0.043	0.23
1.76	1,373	101.76	0.21	0.21	0.00	---	---	---	---	---	0.043	0.25
1.92	1,498	101.92	0.23	0.23	0.00	---	---	---	---	---	0.043	0.27
2.08	1,622	102.08	0.24	0.24	0.00	---	---	---	---	---	0.043	0.29
2.24	1,747	102.24	0.27	0.26	0.01	---	---	---	---	---	0.043	0.31
2.40	1,872	102.40	0.38	0.27	0.11	---	---	---	---	---	0.043	0.43
2.56	1,997	102.56	0.57	0.25	0.31	---	---	---	---	---	0.043	0.61
2.72	2,122	102.72	0.72	0.22	0.49	---	---	---	---	---	0.043	0.76
2.88	2,246	102.88	0.82	0.20	0.62	---	---	---	---	---	0.043	0.86
3.04	2,371	103.04	0.90	0.18	0.72	---	---	---	---	---	0.043	0.94
3.20	2,496	103.20	0.93	0.19	0.74	---	---	---	---	---	0.043	0.97

Hydrograph Plot

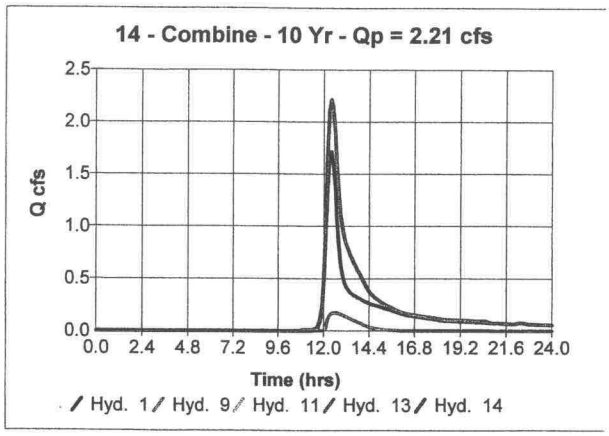
Hydraflow Hydrographs by Intelisolve

Hyd. No. 14

POSTDEVELOPMENT WS III

Hydrograph type	= Combine	Peak discharge	= 2.21 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyds.	= 1, 9, 11, 13		

Hydrograph Volume = 13,570 cuf



Hydrograph Plot

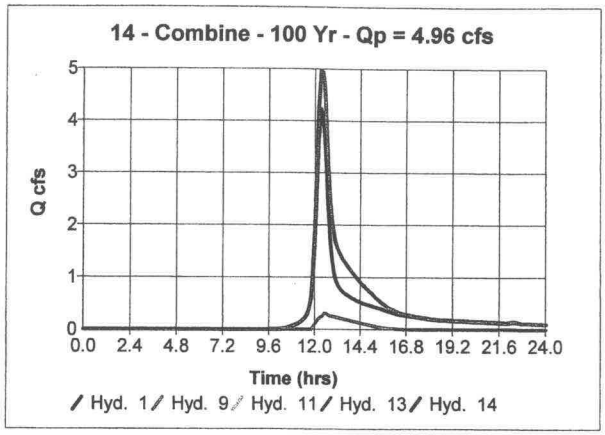
Hydraflow Hydrographs by Intelisolve

Hyd. No. 14

POSTDEVELOPMENT WS III

Hydrograph type	= Combine	Peak discharge	= 4.96 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 1, 9, 11, 13		

Hydrograph Volume = 30,057 cuft



Hydrograph Plot

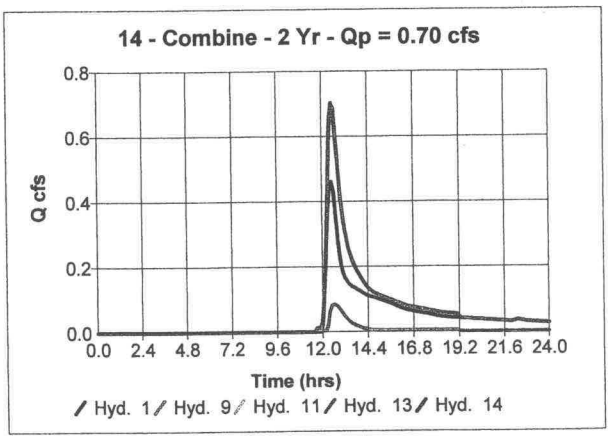
Hydraflow Hydrographs by Intelisolve

Hyd. No. 14

POSTDEVELOPMENT WS III

Hydrograph type	= Combine	Peak discharge	= 0.70 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyds.	= 1, 9, 11, 13		

Hydrograph Volume = 4,809 cuft



WATERSHED III

POSTDEVELOPMENT

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

WS IV Existing
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.240
Flow length	= 160.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 5.0 %
Travel Time	**= 14.6 min**

Shallow Concentrated Flow

Flow length	= 0 ft
Watercourse slope	= 0.0 %
Surface description	= Unpaved
Average velocity	= 0.00 ft/s
Travel Time	**= 0.0 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc ..... **= 14.6 min**

Hydrograph Plot

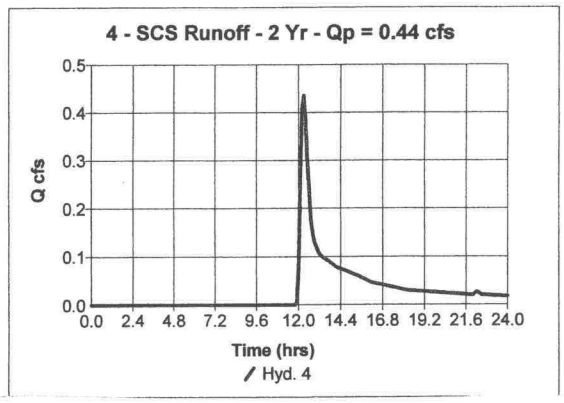
Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

WS IV Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 0.44 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 1.60 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.6 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,588 cuft



Hydrograph Plot

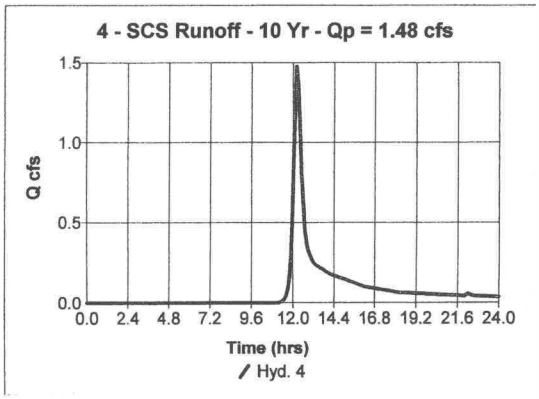
Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

WS IV Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 1.48 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 1.60 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.6 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6,871



Hydrograph Plot

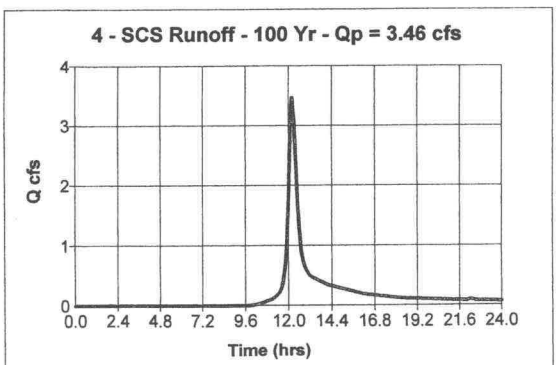
Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

WS IV Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 3.46 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 1.60 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.6 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 14,985 cuft



WATERSHED IV
PREDEVELOPMENT

3-22

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 3 - VAULT FIRST FAIRWAY

Pond Data

Bottom LxW = 78.0 x 22.0 ft Side slope = 0.0:1 Bottom elev. = 58.00 ft Depth = 4.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	58.00	1,716	0	0
0.23	58.23	1,716	386	386
0.45	58.45	1,716	386	772
0.68	58.68	1,716	386	1,158
0.90	58.90	1,716	386	1,544
1.13	59.13	1,716	386	1,931
1.35	59.35	1,716	386	2,317
1.58	59.58	1,716	386	2,703
1.80	59.80	1,716	386	3,089
2.03	60.03	1,716	386	3,475
2.25	60.25	1,716	386	3,861
2.48	60.48	1,716	386	4,247
2.70	60.70	1,716	386	4,633
2.93	60.93	1,716	386	5,019
3.15	61.15	1,716	386	5,405
3.38	61.38	1,716	386	5,792
3.60	61.60	1,716	386	6,178
3.82	61.83	1,716	386	6,564
4.05	62.05	1,716	386	6,950
4.27	62.28	1,716	386	7,336
4.50	62.50	1,716	386	7,722

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 12.0	2.0	8.0	0.0
Span in	= 12.0	2.0	8.0	0.0
No. Barrels	= 1	1	1	0
Invert El. ft	= 58.00	58.00	60.50	0.00
Length ft	= 50.0	1.0	1.0	0.0
Slope %	= 0.50	0.50	0.50	0.00
N-Value	= .013	.013	.013	.000
Orif. Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	58.00	0.00	0.00	0.00	---	---	---	---	---	---	0.00
0.23	386	58.23	0.04	0.04	0.00	---	---	---	---	---	---	0.04
0.45	772	58.45	0.06	0.06	0.00	---	---	---	---	---	---	0.06
0.68	1,158	58.68	0.08	0.08	0.00	---	---	---	---	---	---	0.08
0.90	1,544	58.90	0.09	0.09	0.00	---	---	---	---	---	---	0.09
1.13	1,931	59.13	0.11	0.10	0.00	---	---	---	---	---	---	0.10
1.35	2,317	59.35	0.11	0.11	0.00	---	---	---	---	---	---	0.11
1.58	2,703	59.58	0.13	0.12	0.00	---	---	---	---	---	---	0.12
1.80	3,089	59.80	0.14	0.13	0.00	---	---	---	---	---	---	0.13
2.03	3,475	60.03	0.15	0.14	0.00	---	---	---	---	---	---	0.14
2.25	3,861	60.25	0.16	0.15	0.00	---	---	---	---	---	---	0.15
2.48	4,247	60.48	0.16	0.16	0.00	---	---	---	---	---	---	0.16
2.70	4,633	60.70	0.31	0.16	0.13	---	---	---	---	---	---	0.30
2.93	5,019	60.93	0.69	0.17	0.52	---	---	---	---	---	---	0.69
3.15	5,405	61.15	1.13	0.17	0.95	---	---	---	---	---	---	1.12
3.38	5,792	61.38	1.42	0.17	1.24	---	---	---	---	---	---	1.41
3.60	6,178	61.60	1.65	0.18	1.47	---	---	---	---	---	---	1.65
3.82	6,564	61.83	1.85	0.18	1.67	---	---	---	---	---	---	1.85
4.05	6,950	62.05	2.04	0.18	1.85	---	---	---	---	---	---	2.04
4.27	7,336	62.28	2.20	0.19	2.02	---	---	---	---	---	---	2.20
4.50	7,722	62.50	2.36	0.19	2.17	---	---	---	---	---	---	2.36

Hydrograph Plot

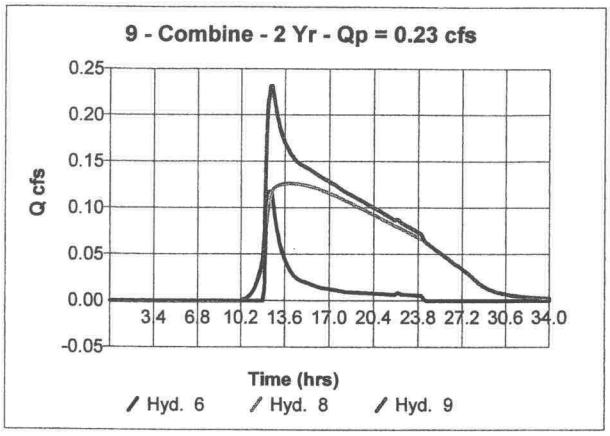
Hydraflow Hydrographs by Intelisolve

Hyd. No. 9

POSTDEVELOPEMENT

Hydrograph type	= Combine	Peak discharge	= 0.23 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyds.	= 6, 8		

Hydrograph Volume = 6,352 cuft



Hydrograph Plot

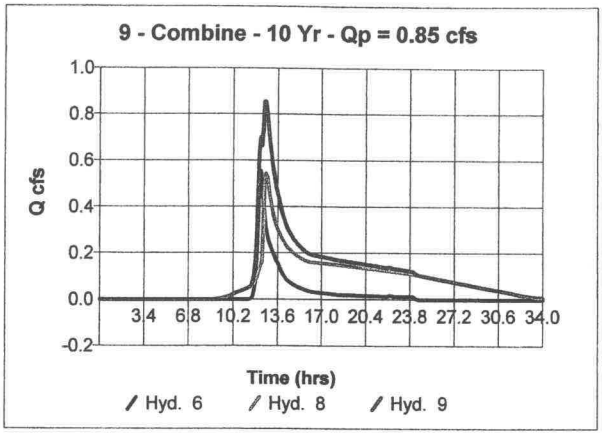
Hydraflow Hydrographs by Intelisolve

Hyd. No. 9

POSTDEVELOPEMENT

Hydrograph type	= Combine	Peak discharge	= 0.85 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyds.	= 6, 8		

Hydrograph Volume = 13,208 cuft



Hydrograph Plot

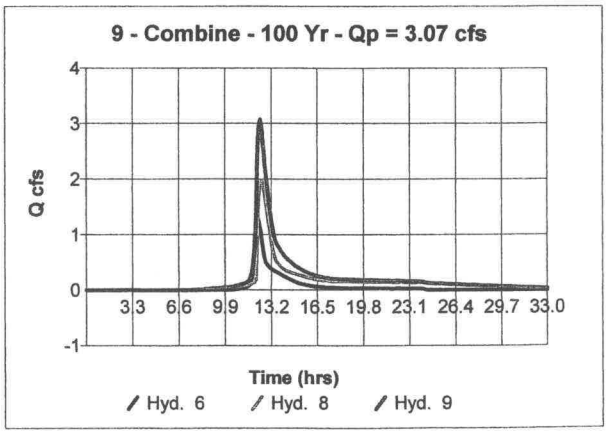
Hydraflow Hydrographs by Intelisolve

Hyd. No. 9

POSTDEVELOPEMENT

Hydrograph type	= Combine	Peak discharge	= 3.07 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 6, 8		

Hydrograph Volume = 24,866 cuft



POSTDEVELOPMENT
WATERSHED V

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

WS VI EXISTING
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.240
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 3.5 %
Travel Time	**= 11.6 min**

Shallow Concentrated Flow

Flow length	= 120 ft
Watercourse slope	= 0.5 %
Surface description	= Unpaved
Average velocity	= 1.14 ft/s
Travel Time	**= 1.8 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc **= 13.3 min**

Hydrograph Plot

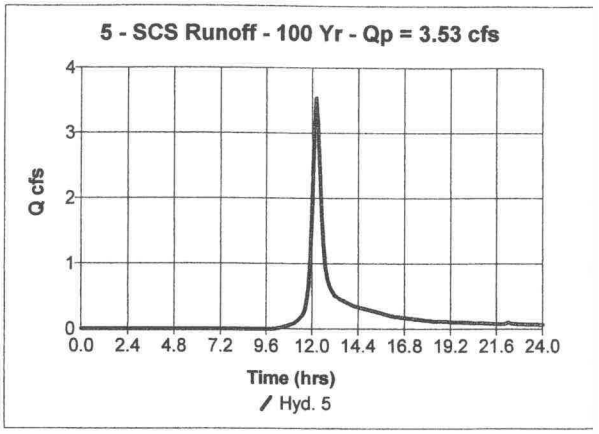
Hydraflow Hydrographs by Intelisolv

Hyd. No. 5

WS VI EXISTING

Hydrograph type	= SCS Runoff	Peak discharge	= 3.53 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 1.70 ac	Curve number	= 62
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.3 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 15,360 cu



Hydrograph Plot

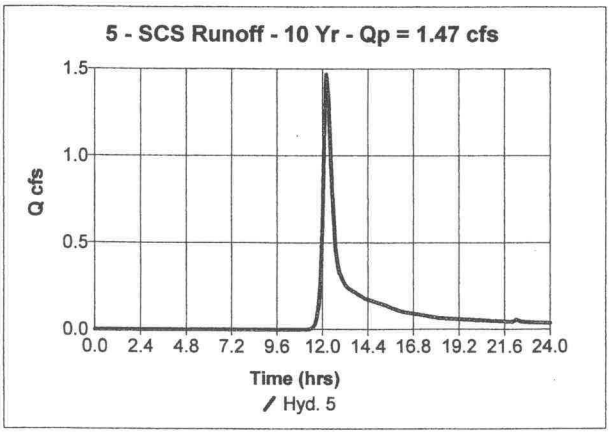
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

WS VI EXISTING

Hydrograph type	= SCS Runoff	Peak discharge	= 1.47 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 1.70 ac	Curve number	= 62
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.3 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6,931 cuft



Hydrograph Plot

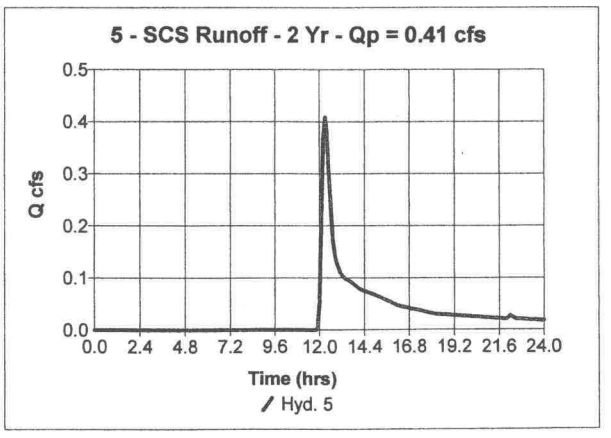
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

WS VI EXISTING

Hydrograph type	= SCS Runoff	Peak discharge	= 0.41 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 1.70 ac	Curve number	= 62
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.3 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,539 cuft



WATERSHED VI
PREDEVELOPMENT
NO OFF SITE FLOW

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

WS VII EXISTING
Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.400
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 3.0 %
Travel Time	**= 18.6 min**

Shallow Concentrated Flow

Flow length	= 125 ft
Watercourse slope	= 8.0 %
Surface description	= Unpaved
Average velocity	= 4.56 ft/s
Travel Time	**= 0.5 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft
Travel Time	**= min**

Total Travel Time, Tc ..... **= 19.0 min**

Hydrograph Plot

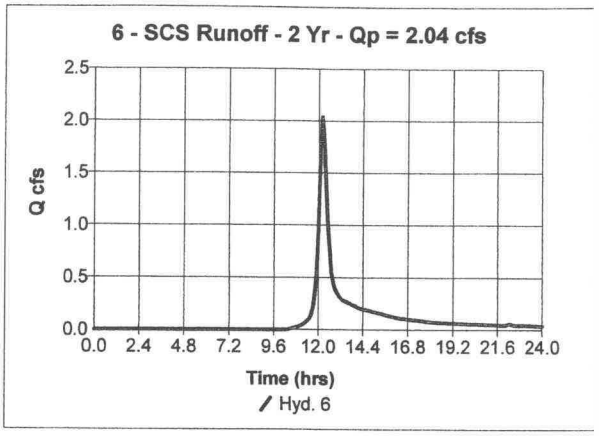
Hydraflow Hydrographs by Intelisolv

Hyd. No. 6

WS VII EXISTING

Hydrograph type	= SCS Runoff	Peak discharge	= 2.04 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 2.30 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 8,930 cu



Hydrograph Plot

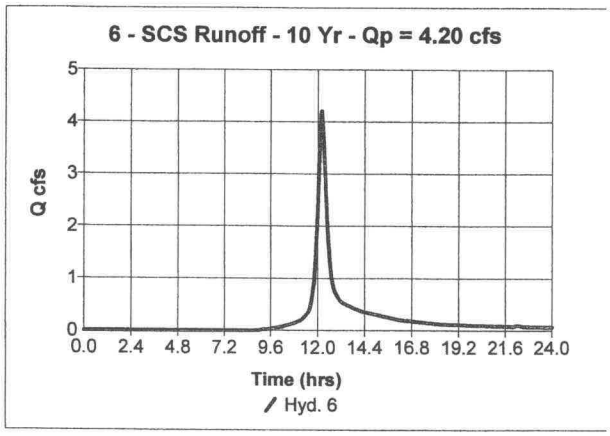
Hydraflow Hydrographs by Intelisolv

Hyd. No. 6

WS VII EXISTING

Hydrograph type	= SCS Runoff	Peak discharge	= 4.20 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 2.30 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 17,941 cuf



Hydrograph Plot

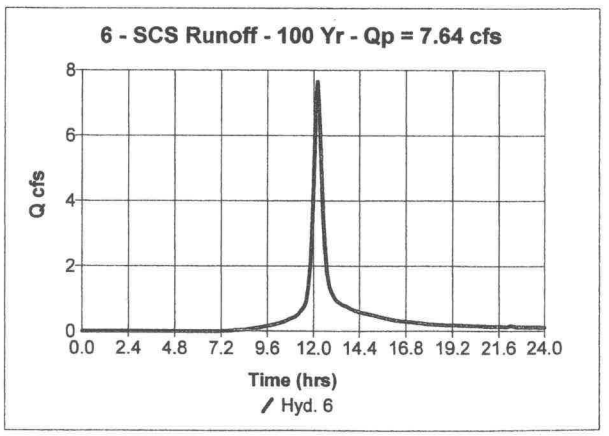
Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

WS VII EXISTING

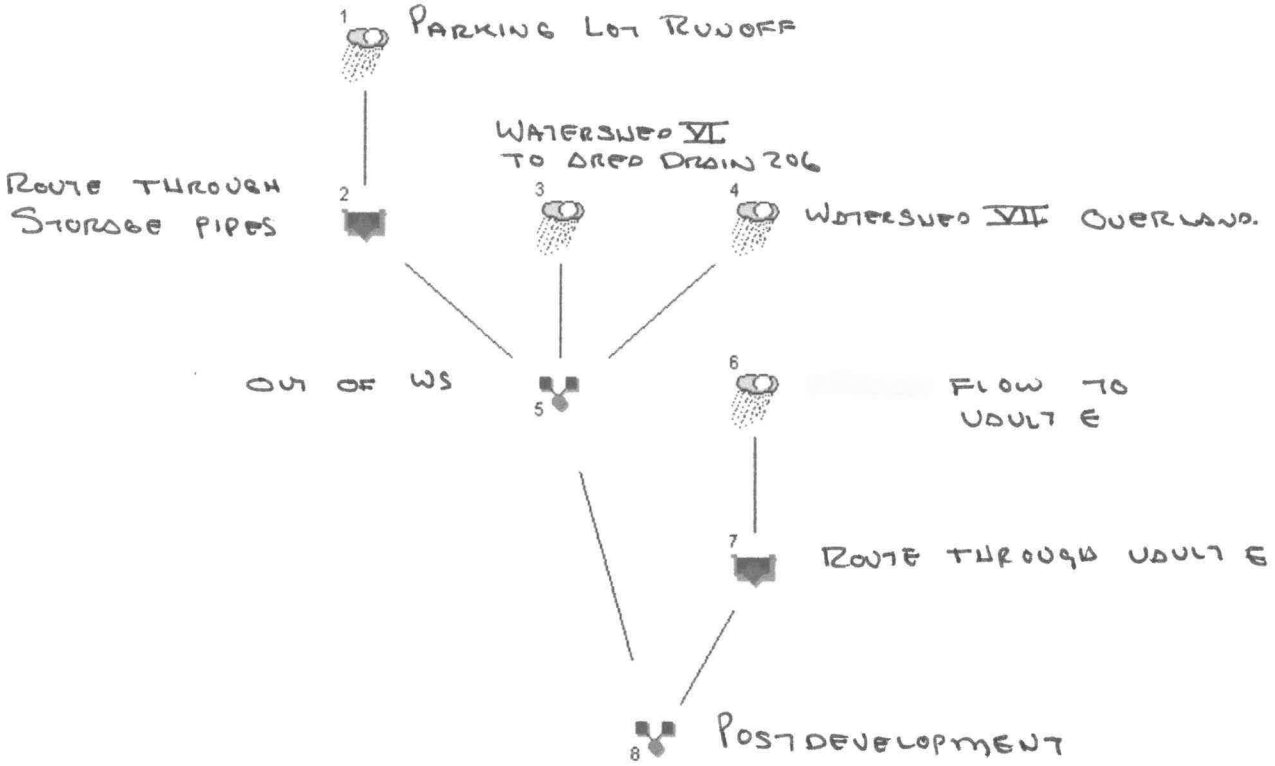
Hydrograph type	= SCS Runoff	Peak discharge	= 7.64 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 2.30 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 32,768 cuft



WATERSHED VII

PREDEVELOPMENT



WATERSHEDS VI AND VII
POST DEVELOPMENT.

Hydraflow Hydrographs Diagram	Project: New Meadows Parking.gpw	10-29-2008

Hydrograph Plot

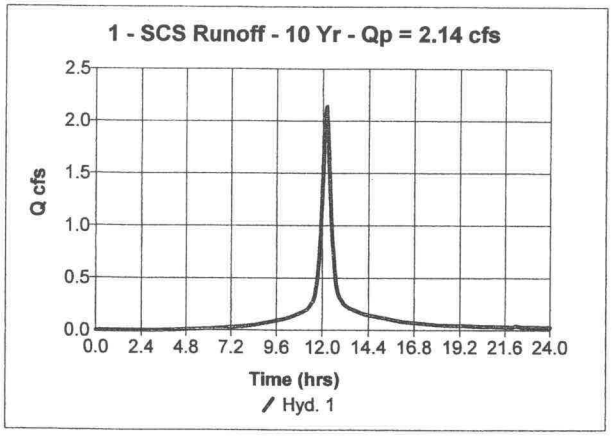
Hydraflow Hydrographs by Intellisolve

Hyd. No. 1

PARKING LOT TO STORAGE PIPES

Hydrograph type	= SCS Runoff	Peak discharge	= 2.14 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 0.75 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 9,713 cuft



Hydrograph Plot

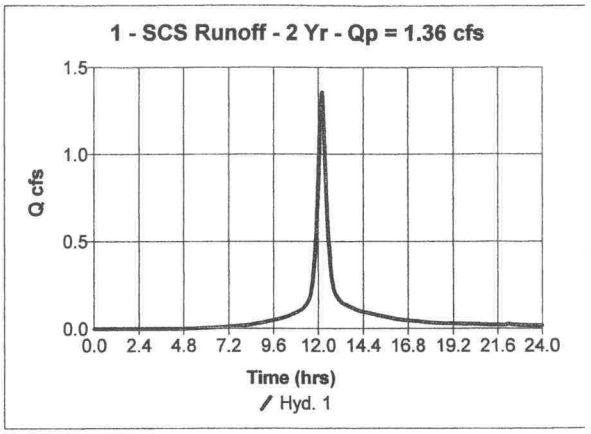
Hydraflow Hydrographs by Intellisol

Hyd. No. 1

PARKING LOT TO STORAGE PIPES

Hydrograph type	= SCS Runoff	Peak discharge	= 1.36 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 0.75 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5,998 c



Hydrograph Plot

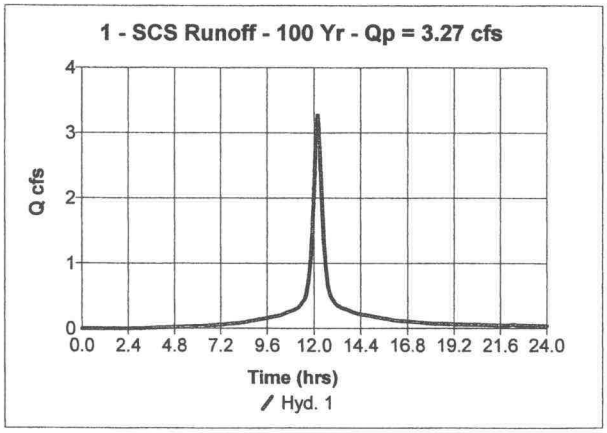
Hydraflow Hydrographs by Intellisolve

Hyd. No. 1

PARKING LOT TO STORAGE PIPES

Hydrograph type	= SCS Runoff	Peak discharge	= 3.27 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 0.75 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 15,246 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

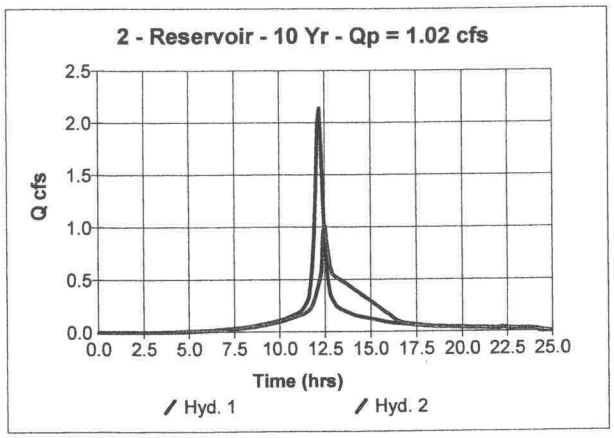
Hyd. No. 2

ROUTE THRU STOR.PIPES

Hydrograph type	= Reservoir	Peak discharge	= 1.02 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyd. No.	= 1	Reservoir name	= Piped Storage
Max. Elevation	= 59.33 ft	Max. Storage	= 2,826 cuft

Storage Indication method used.

Hydrograph Volume = 9,705 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

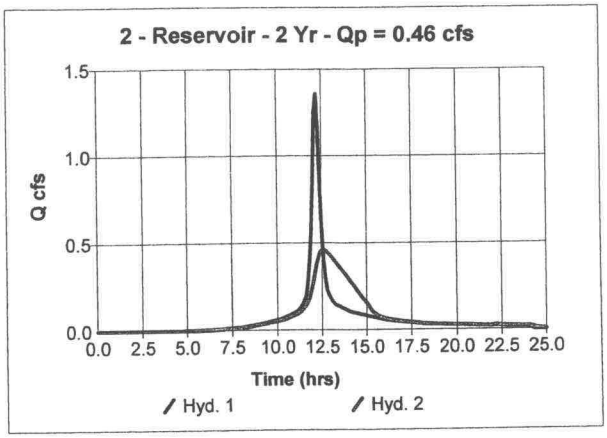
Hyd. No. 2

ROUTE THRU STOR.PIPES

Hydrograph type	= Reservoir	Peak discharge	= 0.46 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyd. No.	= 1	Reservoir name	= Piped Storage
Max. Elevation	= 58.53 ft	Max. Storage	= 1,739 cuft

Storage Indication method used.

Hydrograph Volume = 5,989 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

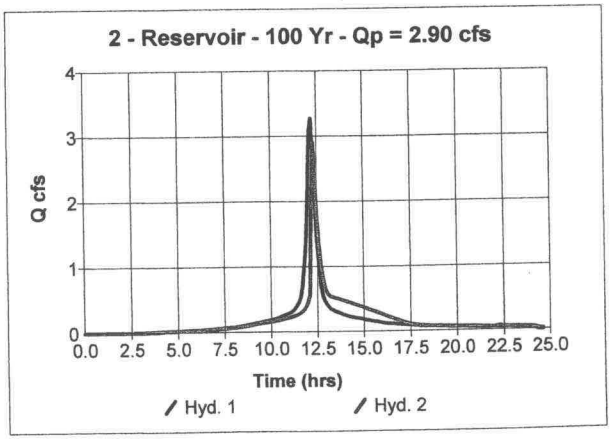
Hyd. No. 2

ROUTE THRU STOR.PIPES

Hydrograph type	= Reservoir	Peak discharge	= 2.90 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyd. No.	= 1	Reservoir name	= Piped Storage
Max. Elevation	= 59.88 ft	Max. Storage	= 3,343 cuft

Storage Indication method used.

Hydrograph Volume = 15,237 cuft



Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - Piped Storage

Pond Data

Pipe dia. = 3.00 ft Pipe length = 40.0 ft No. Barrels = 12.0 Slope = 0.00 % Invert elev. = 57.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	57.00	00	0	0
0.15	57.15	00	64	64
0.30	57.30	00	113	177
0.45	57.45	00	143	319
0.60	57.60	00	164	483
0.75	57.75	00	180	664
0.90	57.90	00	193	857
1.05	58.05	00	203	1,059
1.20	58.20	00	208	1,268
1.35	58.35	00	214	1,482
1.50	58.50	00	215	1,697
1.65	58.65	00	215	1,912
1.80	58.80	00	214	2,127
1.95	58.95	00	209	2,336
2.10	59.10	00	202	2,538
2.25	59.25	00	193	2,730
2.40	59.40	00	180	2,911
2.55	59.55	00	164	3,075
2.70	59.70	00	143	3,217
2.85	59.85	00	113	3,330
3.00	60.00	00	63	3,394

STRUCTURE LOWERED TO INV = 56.00 IN FINAL DESIGN.

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 12.0	4.0	12.0	0.0
Span in	= 12.0	4.0	12.0	0.0
No. Barrels	= 1	1	1	0
Invert El. ft	= 57.00	57.00	59.00	0.00
Length ft	= 100.0	10.0	10.0	0.0
Slope %	= 1.00	1.00	1.00	0.00
N-Value	= .013	.013	.013	.000
Orif. Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	57.00	0.00	0.00	0.00	---	---	---	---	---	---	0.00
0.15	64	57.15	0.04	0.04	0.00	---	---	---	---	---	---	0.04
0.30	177	57.30	0.14	0.14	0.00	---	---	---	---	---	---	0.14
0.45	319	57.45	0.20	0.20	0.00	---	---	---	---	---	---	0.20
0.60	483	57.60	0.25	0.25	0.00	---	---	---	---	---	---	0.25
0.75	664	57.75	0.29	0.29	0.00	---	---	---	---	---	---	0.29
0.90	857	57.90	0.34	0.33	0.00	---	---	---	---	---	---	0.33
1.05	1,059	58.05	0.37	0.37	0.00	---	---	---	---	---	---	0.37
1.20	1,268	58.20	0.40	0.40	0.00	---	---	---	---	---	---	0.40
1.35	1,482	58.35	0.44	0.43	0.00	---	---	---	---	---	---	0.43
1.50	1,697	58.50	0.46	0.45	0.00	---	---	---	---	---	---	0.45
1.65	1,912	58.65	0.48	0.48	0.00	---	---	---	---	---	---	0.48
1.80	2,127	58.80	0.52	0.51	0.00	---	---	---	---	---	---	0.51
1.95	2,336	58.95	0.54	0.53	0.00	---	---	---	---	---	---	0.53
2.10	2,538	59.10	0.60	0.55	0.04	---	---	---	---	---	---	0.59
2.25	2,730	59.25	0.84	0.56	0.26	---	---	---	---	---	---	0.83
2.40	2,911	59.40	1.21	0.57	0.65	---	---	---	---	---	---	1.21
2.55	3,075	59.55	1.71	0.57	1.13	---	---	---	---	---	---	1.70
2.70	3,217	59.70	2.26	0.57	1.69	---	---	---	---	---	---	2.26
2.85	3,330	59.85	2.81	0.56	2.24	---	---	---	---	---	---	2.81
3.00	3,394	60.00	3.23	0.56	2.67	---	---	---	---	---	---	3.23

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

PROPOSED WS VI

Storm frequency = yrs

Sheet Flow

Manning's n-value	= 0.240
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 3.10 in
Land slope	= 2.0 %

Travel Time ..... **= 14.5 min**

Shallow Concentrated Flow

Flow length	= 110 ft
Watercourse slope	= 1.0 %
Surface description	= Unpaved
Average velocity	= 1.61 ft/s

Travel Time ..... **= 1.1 min**

Channel Flow

Cross section flow area	= 0.0 sqft
Wetted perimeter	= 0.0 ft
Channel slope	= 0.0 %
Manning's n-value	= 0.015
Velocity	= 0.00 ft/s
Flow length	= 0.0 ft

Travel Time ..... **= min**

Total Travel Time, Tc ..... **= 15.6 min**

Hydrograph Plot

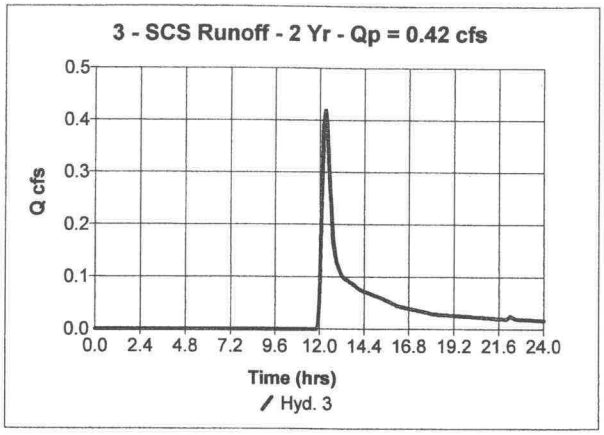
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

PROPOSED WS VI

Hydrograph type	= SCS Runoff	Peak discharge	= 0.42 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 1.54 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.6 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,491 cuft



Hydrograph Plot

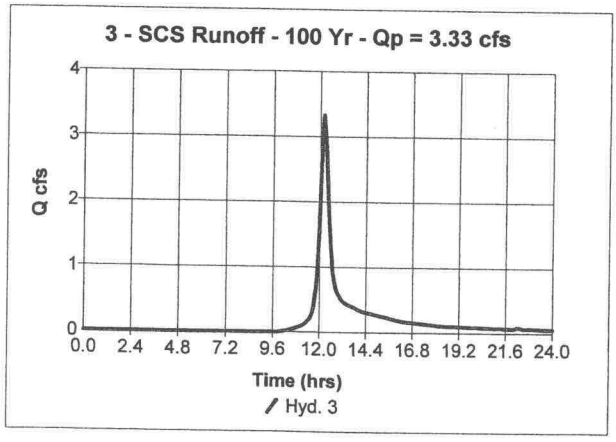
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

PROPOSED WS VI

Hydrograph type	= SCS Runoff	Peak discharge	= 3.33 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 1.54 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.6 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 14,423 cuft



Hydrograph Plot

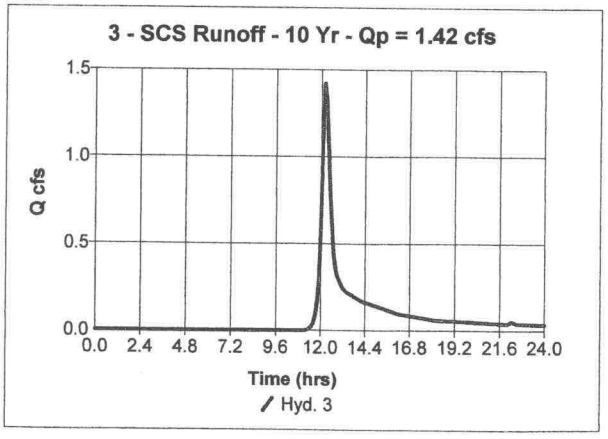
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

PROPOSED WS VI

Hydrograph type	= SCS Runoff	Peak discharge	= 1.42 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 1.54 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.6 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6,813 cuft



Hydrograph Plot

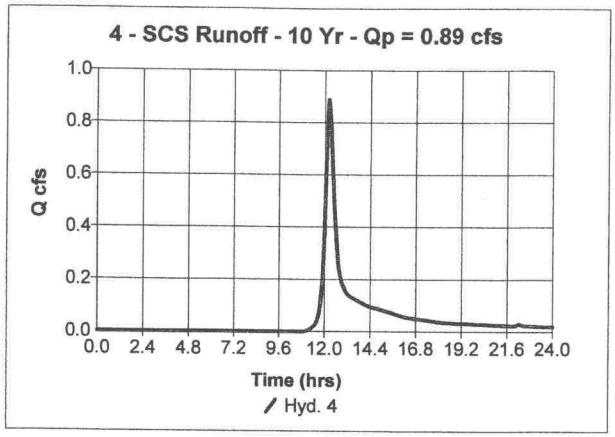
Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

PROP. WS VII OVERLAND

Hydrograph type	= SCS Runoff	Peak discharge	= 0.89 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 0.85 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.6 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4,031 cuft



Hydrograph Plot

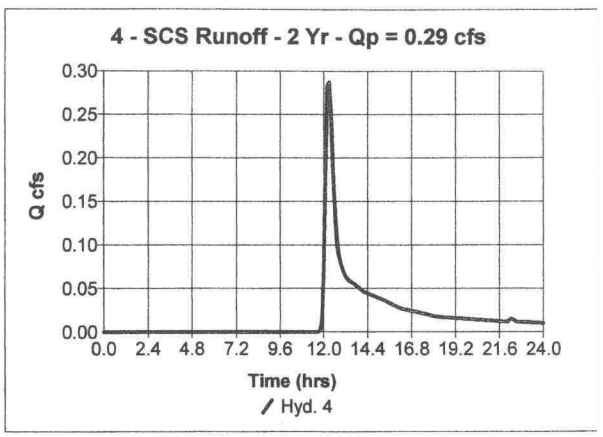
Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

PROP. WS VII OVERLAND

Hydrograph type	= SCS Runoff	Peak discharge	= 0.29 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 0.85 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.6 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,598 cuft



Hydrograph Plot

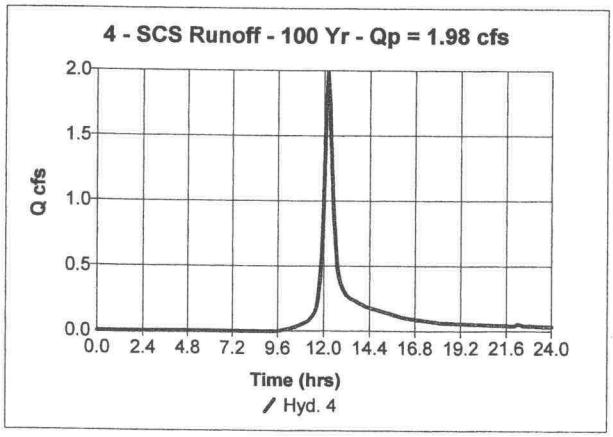
Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

PROP. WS VII OVERLAND

Hydrograph type	= SCS Runoff	Peak discharge	= 1.98 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 0.85 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.6 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 8,530 cuft



TR55 Tc Worksheet

Hyd. No. 4

PROP. WS VII OVERLAND
Storm frequency = yrs

Sheet Flow		
Manning's n-value	= 0.240	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 3.10 in	
Land slope	= 6.0 %	
Travel Time		= 9.3 min
Shallow Concentrated Flow		
Flow length	= 170 ft	
Watercourse slope	= 2.0 %	
Surface description	= Unpaved	
Average velocity	= 2.28 ft/s	
Travel Time		= 1.2 min
Channel Flow		
Cross section flow area	= 0.0 sqft	
Wetted perimeter	= 0.0 ft	
Channel slope	= 0.0 %	
Manning's n-value	= 0.015	
Velocity	= 0.00 ft/s	
Flow length	= 0.0 ft	
Travel Time		= min
Total Travel Time, Tc		= 10.6 min

Hydrograph Plot

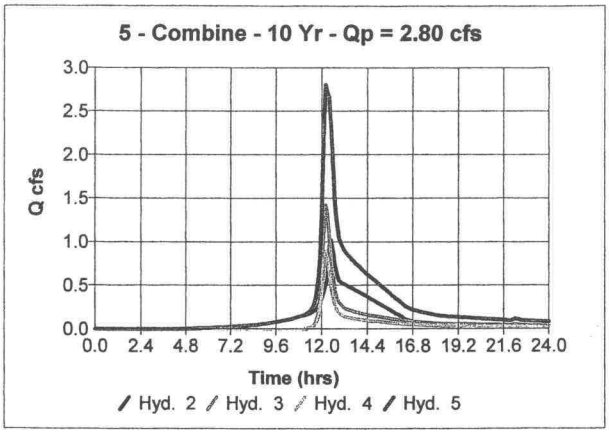
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

POPOSED VI + VII

Hydrograph type	= Combine	Peak discharge	= 2.80 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyds.	= 2, 3, 4		

Hydrograph Volume = 20,349 cuft



drograph Plot

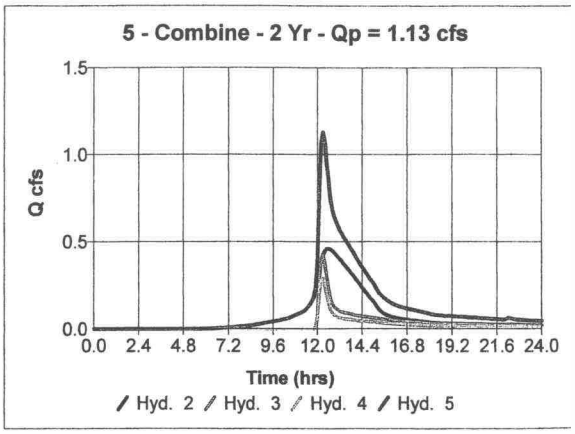
Hydraflow Hydrographs by Intel

. No. 5

OSED VI + VII

ograph type	= Combine	Peak discharge	= 1.13 cfs
n frequency	= 2 yrs	Time interval	= 6 min
v hyds.	= 2, 3, 4		

Hydrograph Volume = 10,07



Hydrograph Plot

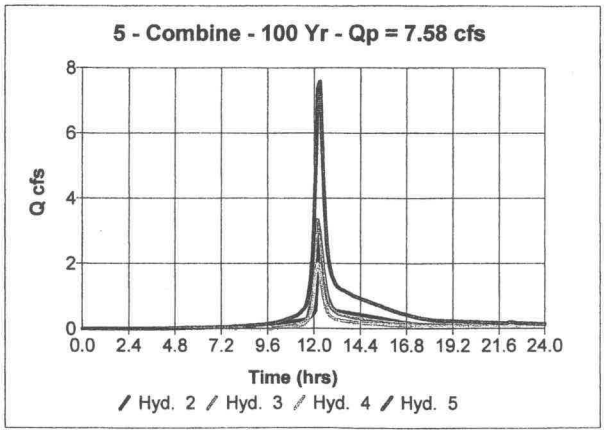
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

POPOSED VI + VII

Hydrograph type	= Combine	Peak discharge	= 7.58 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 2, 3, 4		

Hydrograph Volume = 38,191 cuft



COMBINED WATERSHEDS VI & VII
POST DEVELOPMENT.
WITHOUT VAULT E

Hydrograph Plot

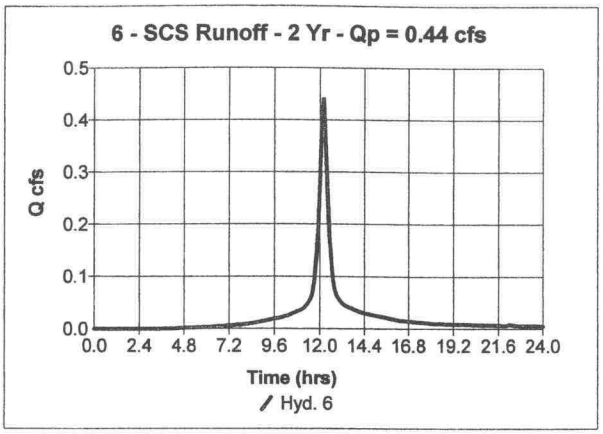
Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

INFLOW TO VAULT E

Hydrograph type	= SCS Runoff	Peak discharge	= 0.44 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 0.23 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,994 cuft



Hydrograph Plot

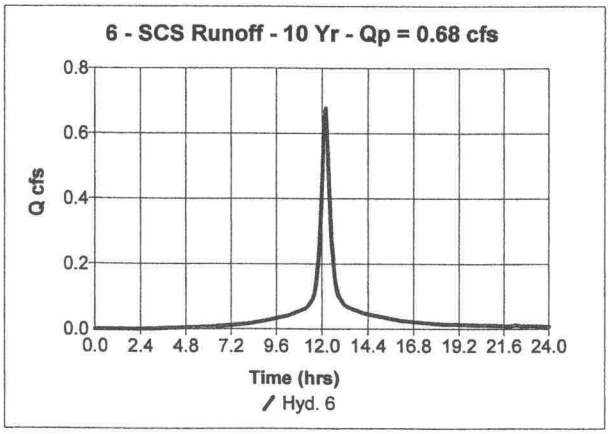
Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

INFLOW TO VAULT E

Hydrograph type	= SCS Runoff	Peak discharge	= 0.68 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 0.23 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,149 cuft



Hydrograph Plot

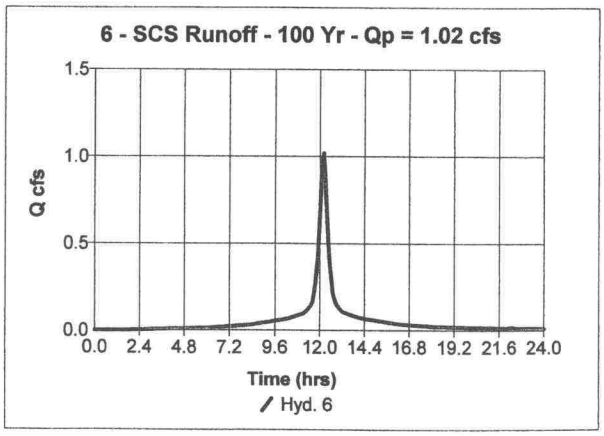
Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

INFLOW TO VAULT E

Hydrograph type	= SCS Runoff	Peak discharge	= 1.02 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 0.23 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 6.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4,858 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

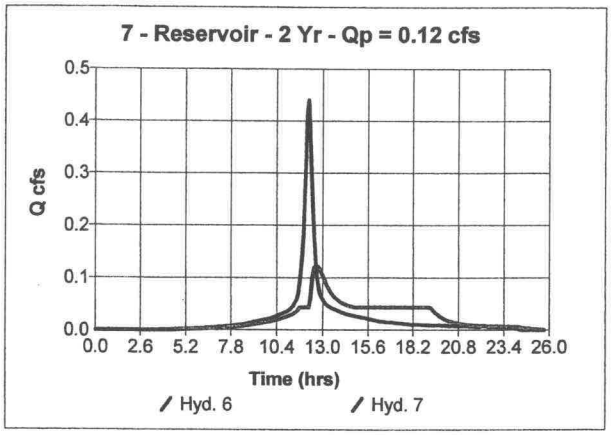
Hyd. No. 7

ROUTE THRU VAULT E

Hydrograph type	= Reservoir	Peak discharge	= 0.12 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyd. No.	= 6	Reservoir name	= VAULT E
Max. Elevation	= 100.98 ft	Max. Storage	= 766 cuft

Storage indication method used.

Hydrograph Volume = 1,991 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

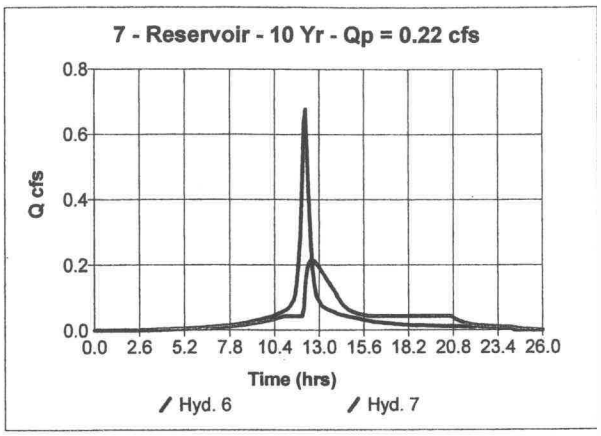
Hyd. No. 7

ROUTE THRU VAULT E

Hydrograph type	= Reservoir	Peak discharge	= 0.22 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyd. No.	= 6	Reservoir name	= VAULT E
Max. Elevation	= 101.49 ft	Max. Storage	= 1,159 cuft

Storage indication method used.

Hydrograph Volume = 3,147 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

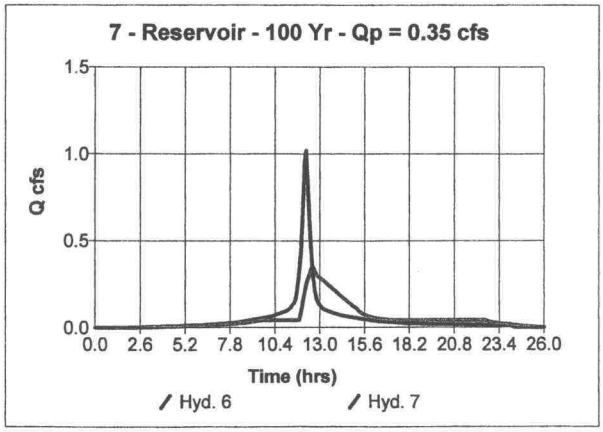
Hyd. No. 7

ROUTE THRU VAULT E

Hydrograph type	= Reservoir	Peak discharge	= 0.35 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyd. No.	= 6	Reservoir name	= VAULT E
Max. Elevation	= 102.31 ft	Max. Storage	= 1,805 cuft

Storage indication method used.

Hydrograph Volume = 4,855 cuft



Hydrograph Plot

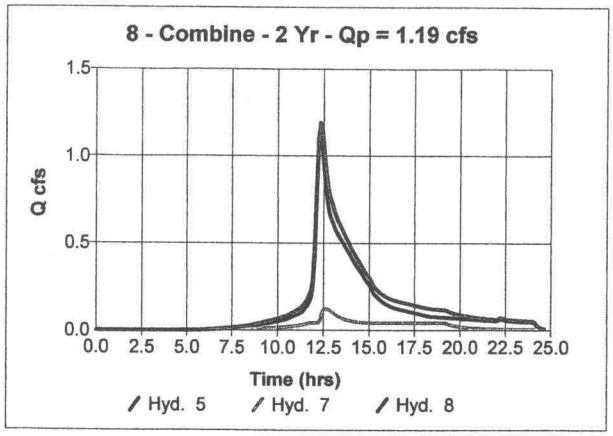
Hydraflow Hydrographs by Intelisolve

Hyd. No. 8

POSTDEVELOPMENT

Hydrograph type	= Combine	Peak discharge	= 1.19 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 12,089 cuft



Hydrograph Plot

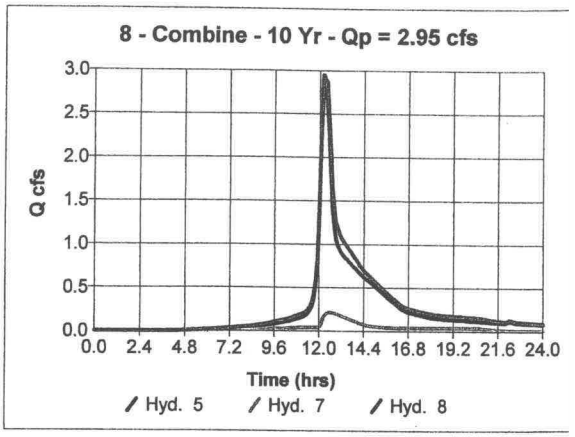
Hydraflow Hydrographs by Int

Hyd. No. 8

POSTDEVELOPMENT

Hydrograph type	= Combine	Peak discharge	= 2.95 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 23,4



Hydrograph Plot

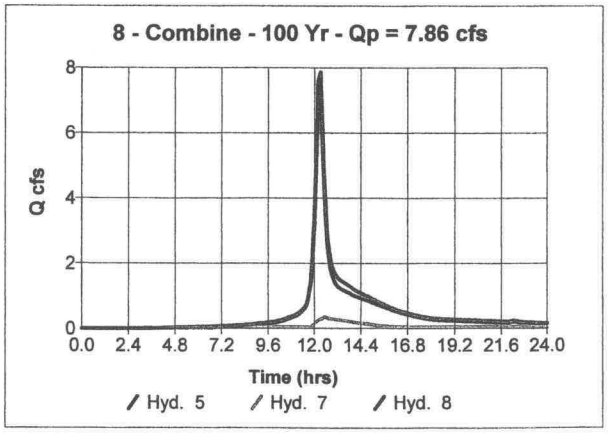
Hydraflow Hydrographs by Intelisolve

Hyd. No. 8

POSTDEVELOPMENT

Hydrograph type	= Combine	Peak discharge	= 7.86 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 43,046 cuft



POSTDEVELOPMENT
WATERSHEDS VI AND VII

STANDARD 3
GROUNDWATER RECHARGE ANALYSIS

EASTERN LAND SURVEY ASSOCIATES, INC.
Christopher R. Mello PLS
104 Lowell Street
PEABODY, MA 01960
(978) 531-8121

JOB THE MEADOWS - TOPSFIELD, MA.
SHEET NO. 1 OF 4
CALCULATED BY JAM DATE 10/08
CHECKED BY _____ DATE _____
SCALE _____

STANDARD 3
GROUNDWATER RECHARGE CALCULATIONS.

I. DETERMINE REQUIRED RECHARGE VOLUME

ALL PROPOSED ACTIVITIES RESULTING IN NEW IMPERVIOUS SURFACES ARE LOCATED OVER HSG B SOILS.

REQUIRED RECHARGE VOLUME = 0.35"/Imp. Acre

EXISTING IMPERVIOUS COVERAGE = 58,445 SF.

PROPOSED IMPERVIOUS COVERAGE = 145,220 SF.

REQUIRED RECHARGE VOLUME =
(145,220 - 58,445) x .35"/12"/FT
= 2531 CF.

II DETERMINE CAPTURE AREA ADJUSTMENT

NEW IMPERVIOUS AREA = 86,775 SF.

AREAS ROUTED TO INFILTRATION BMPS.

a. 6 BUILDINGS @ 8400 SF = 50,400 SF
b. PAVEMENT IN WATERSHED I = 12,625 SF
c. PATIOS/DECKS TO INFILT./STOR. VAULTS (SEACH) = 7000 SF
TOTAL = 70,025 SF

CAPTURE AREA ADJUSTMENT = 86,775/70,025 = 1.24

REQUIRED WATER QUALITY VOLUME =
2531CF X 1.24 = 2915 CF.
PROPOSED WATER QUALITY VOLUME = 7880 CF OK
(SEE PAGES 2-4)

EASTERN LAND SURVEY ASSOCIATES, INC.
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JOB THE MEADOWS - TOPSFIELD
SHEET NO. 2 OF 4
CALCULATED BY JHM DATE 10/08
CHECKED BY CRM DATE
SCALE

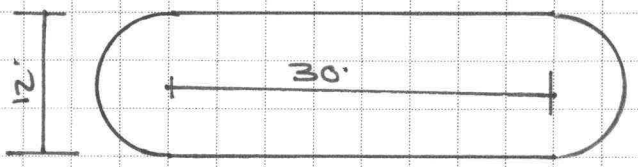
BIORETENTION CELL DESIGN.

1. SURFACE AREA : 5-10 % OF TRIBUTARY AREA.
ROOF AREA / 4 UNITS = 8400 SF

CELL AREA SHOULD BE 420 - 840 SF

PROPOSED CELL AREA:

SURFACE AREA =
12' x 30' + $6^2\pi$ = 473 SF, OK



2. FOR WQV = .35" (HSG B SOILS) ; REQUIRED WQV
= 8400 x .35 x 1/12 = 245 CF

SURFACE PONDING (ASSUME 6" DEPTH & 3:1 SIDE SLOPE)

$V = \frac{473\ SF + 336\ SF}{2} \times .5' = 202\ CF$.

STORAGE IN SOIL - ASSUME 30% VOIDS.

V = 473 SF x 2' (depth) x .30 = 283 CF.
PROVIDED WQV = 503 CF, OK

3. CHECK DRAWDOWN TIME FOR REQUIRED WQV OF 245 CF
H.S.G. B - SANDY LOAM W/ WORST CASE
INFILTRATION RATE = 1.02" /HR.
HOURLY INFILTRATION RATE = 473 SF x 1.02"/12"
= 40 CF/HR.
INFILTRATION (DRAWDOWN) TIME FOR 245 CF
= 245/40 = 6.13 HOUR OK.

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JOB THE MEADOWS - TOPSFIELD.
SHEET NO. 3 OF 4
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

INFILTRATION / STORAGE VAULTS.

DESIGN TO TAKE ROOF OVERFLOW FROM RAIN GARDENS AND RUNOFF FROM PATIOS (OR DECKS). ASSUMED CN FOR PATIO/DECK PORTION OF INFLOW = 80 (SEE RCN CALCULATIONS).

INFILTRATION CAPACITY SHOULD BE FOR AN ADDITIONAL 0.35" OF ROOF RUNOFF.

1. REQUIRED WQV FOR 10,100 SF (ROOF + PATIO OR DECK) = 10,100 X .35"/12" = 295 CF.

6" STONE + 6" PONDING IN 10' WIDE X 78' LONG VAULT

10 X 78 X .5 X .4 + .5 X 10 X 78 = 546 CF/FT.

2. CHECK DRAWDOWN TIME FOR THE REQUIRED WQV. OF 295 CF.
INFILTRATION RATE = 2.4"/HOUR.

HOURLY RATE = 10 X 78 X 2.4/12 = 156 CF.

DRAWDOWN TIME 295 CF/156 CF = 1.9 HOUR/FT

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JOB THE MEADOWS - TOPSFIELD.
SHEET NO. 4 OF 4
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

INFILTRATION / STORAGE BASIN C UNIT 1

WATER QUALITY VOLUME BETWEEN ELEVATION 60 AND 60.5

CONTOUR AREAS 60 : 4000 SF
60.5 4475 SF

$WQV = \frac{(4000 + 4475)}{2} \times .50 = 2119$ CF.

CHECK DRAWDOWN TIME:

REQUIRED WQV = .38 Ac x .35"/12" x 43,560 SF/Ac.
= 483 CF.

@ 2.4"/HR, INFILTRATION CAPACITY = 4000 SF $\times \frac{2.4}{12} \times \frac{1}{3600}$
= .22 CFS.

DRAWDOWN TIME = 483 / .22 CFS. = .61 HOUR OK

SUMMARY OF DESIGN WQV'S

A. BIORETENTION CELLS. C @ 505 = 3030 CF

B. STORAGE / INFILT. VAULTS 5C 54C = 2730 CF

C. INFILT. BASIN C UNIT 1 = 2120 CF

TOTAL = 7880 CF

Location Address or Lot No. **WILDES STREET, TOPSFIELD, MA**

STORMWATER SW-100

ON-SITE REVIEW

Deep Hole Number: SW-100 ***Date:*** 06/24/08 ***Time:*** 11:40 ***Weather:*** Cool, clear, 60's, dry

Land Use: Golf Course ***Slope (%):*** ~3% ***Surface Stones:*** Bedrock outcrops in vicinity

Vegetation: Grass lawn ***Landform:*** Rolling outwash plain

Distance from:

Open Water Body	200+	feet	Drainage Way	50+	Feet
Possible Wet Area	100+	feet	Property Line	10+	Feet
Drinking Water Well	100+	feet	Other		Feet

SW-100 DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Layer/ Horizon	Soil Texture (USDA)	Soil Color (EarthColors)	Redoximorphic Features	Other (Structure, Kind & Grade, Consistency, % Gravel, Stones, Boulders…)
0 - 20"	Ap	Sandy Loam	10YR 3/2 dark grayish brown		Friable, medium blocky, weak grade, fine grained, damp, fine grass roots, smooth clear boundary
20 - 28"	Bw	Sandy Loam	7.5YR 4/4 brown		Friable, medium angular blocky, weak grade, fine grained, damp, fine grass roots, diffuse wavy boundary.
28 - 38"	C1	Loamy Sand	2.5Y 5/4 light olive brown	@68" 10Y7/1 7.5YR 3/6	V. Friable, structureless, moderate grade, fine to medium grained, damp, gritty, weakly stratified.
				(c,2,d)	
38 - 75"	C2	Sandy Loam	10YR 4/6 Dark yellow brown		Firm, massive, compact matrix, angular clasts, silty, gritty, damp, free of roots.

HYDROLOGIC SOIL GROUP: B

Geologic Parent Material: Glaciofluvial deposits **Depth to Bedrock:** 75"+

Depth to Groundwater: ***Standing Water in the Hole*** N.O. ***Weeping from Pit Face*** N.O.

Estimated Seasonal High Ground Water Depth: **68" Common, medium and distinct.**

Location Address or Lot No. **WILDES STREET, TOPSFIELD, MA**

STORMWATER SW-101

ON-SITE REVIEW

Deep Hole Number: SW-101 ***Date:*** 06/24/08 ***Time:*** 12:03 ***Weather:*** Cool, clear, 60's, dry

Land Use: Golf Course ***Slope (%):*** ~3% ***Surface Stones:*** Bedrock outcrops in vicinity

Vegetation: Grass lawn ***Landform:*** Rolling outwash plain

Distance from:

Open Water Body	200+	feet	Drainage Way	50+	Feet
Possible Wet Area	100+	feet	Property Line	10+	Feet
Drinking Water Well	100+	feet	Other		Feet

SW-101 DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Layer/ Horizon	Soil Texture (USDA)	Soil Color (EarthColors)	Redoximorphic Features	Other (Structure, Kind & Grade, Consistency, % Gravel, Stones, Boulders…)
0 - 9"	Ap	Sandy Loam	10YR 3/2 dark grayish brown		Friable, medium blocky, weak grade, fine grained, damp, fine grass roots, smooth clear boundary
9 - 18"	Bw	Loamy Sand	7.5YR 4/4 brown		Friable, medium angular blocky, weak grade, fine grained, damp, fine grass roots, diffuse wavy boundary.
18 - 80"	C	Sand	2.5Y 5/4 light olive brown	@60" 10Y7/1 7.5YR 3/6	V. Friable, structureless, moderate grade, fine to medium grained, damp, gritty, weakly stratified.
				(c,2,d)	

HYDROLOGIC SOIL GROUP: B

Geologic Parent Material: Glaciofluvial deposits **Depth to Bedrock:** 80"+

Depth to Groundwater: ***Standing Water in the Hole*** N.O. ***Weeping from Pit Face*** N.O.

Estimated Seasonal High Ground Water Depth: **60" Common, medium and distinct.**

Location Address or Lot No. **WILDES STREET, TOPSFIELD, MA**

STORMWATER SW-102

ON-SITE REVIEW

Deep Hole Number: SW-102 ***Date:*** 06/24/08 ***Time:*** 10:48 ***Weather:*** Cool, clear, 60's, dry

Land Use: Golf Course ***Slope (%):*** ~3% ***Surface Stones:*** Bedrock outcrops in vicinity

Vegetation: Grass lawn ***Landform:*** Rolling outwash plain

Distance from:

Open Water Body	200+	feet	Drainage Way	50+	Feet
Possible Wet Area	100+	feet	Property Line	10+	Feet
Drinking Water Well	100+	feet	Other		Feet

SW-102 DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Layer/ Horizon	Soil Texture (USDA)	Soil Color (EarthColors)	Redoximorphic Features	Other (Structure, Kind & Grade, Consistency, % Gravel, Stones, Boulders…)
0 - 14"	Ap	Sandy Loam	10YR 3/2 dark grayish brown		Friable, medium blocky, weak grade, fine grained, damp, fine grass roots, smooth clear boundary
14 - 24"	Bw	Loamy Sand	7.5YR 4/4 brown		Friable, medium angular blocky, weak grade, fine grained, damp, fine grass roots, diffuse wavy boundary.
24 - 89"	C	Sand	2.5Y 5/4 light olive brown	@58" 10Y7/1 7.5YR 3/6	V. Friable, structureless, moderate grade, fine to medium grained, damp, gritty, weakly stratified.
				(c,2,d)	

HYDROLOGIC SOIL GROUP: B

Geologic Parent Material: Glaciofluvial deposits **Depth to Bedrock:** 89"+

Depth to Groundwater: ***Standing Water in the Hole*** N.O. ***Weeping from Pit Face*** N.O.

Estimated Seasonal High Ground Water Depth: **58" Common, medium and distinct.**

Location Address or Lot No. **WILDES STREET, TOPSFIELD, MA**

STORMWATER SW-103

ON-SITE REVIEW

Deep Hole Number: SW-103 ***Date:*** 06/24/08 ***Time:*** 10:30 ***Weather:*** Cool, clear, 60's, dry

Land Use: Golf Course ***Slope (%):*** ~3% ***Surface Stones:*** Bedrock outcrops in vicinity

Vegetation: Grass lawn ***Landform:*** Rolling outwash plain

Distance from:

Open Water Body	200+	feet	Drainage Way	50+	Feet
Possible Wet Area	100+	feet	Property Line	10+	Feet
Drinking Water Well	100+	feet	Other		Feet

SW-103 DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Layer/ Horizon	Soil Texture (USDA)	Soil Color (EarthColors)	Redoximorphic Features	Other (Structure, Kind & Grade, Consistency, % Gravel, Stones, Boulders…)
0 - 9"	Ap	Sandy Loam	10YR 3/2 dark grayish brown		Friable, medium blocky, weak grade, fine grained, damp, fine grass roots, smooth clear boundary
9 - 14"	Bw	Loamy Sand	7.5YR 4/4 brown		Friable, medium angular blocky, weak grade, fine grained, damp, fine grass roots, diffuse wavy boundary.
14 - 68"	C	Sandy Loam	2.5Y 5/4 light olive brown	@63" 10Y7/1 7.5YR 3/6	Friable, structureless, moderate grade, fine to medium grained, damp, gritty, weakly stratified.
				(c,2,d)	

HYDROLOGIC SOIL GROUP: B

Geologic Parent Material: Glaciofluvial deposits **Depth to Bedrock:** 68"+

Depth to Groundwater: ***Standing Water in the Hole*** N.O. ***Weeping from Pit Face*** N.O.

Estimated Seasonal High Ground Water Depth: **63" Common, medium and distinct.**


341930
342000
342070
342140
342210
342280
342350
4725480
4725410
4725340
4725270
4725200
4725130
4725060
BOSTON ST
WILDES RD
1
420D
421C
420C
260B
421B
421C
253B
N
0
40
80
160
240
Meters
0
150
300
600
900
Feet

3-54

Map Unit Legend

Essex County, Massachusetts, Northern Part (MA605)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	0.3	1.2%
253B A	Hinckley loamy sand, 3 to 8 percent slopes	1.0	4.1%
260B B	Sudbury fine sandy loam, 3 to 8 percent slopes	9.3	37.8%
420C B	Canton fine sandy loam, 8 to 15 percent slopes	5.2	21.2%
420D B	Canton fine sandy loam, 15 to 25 percent slopes	0.0	0.1%
421B B	Canton fine sandy loam, 3 to 8 percent slopes, very stony	3.9	15.9%
421C	Canton fine sandy loam, 8 to 15 percent slopes, very stony	4.9	19.8%
Totals for Area of Interest (AOI)		24.5	100.0%

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
AnB, AnC, AnD----- Annisquam	C	None--------	---	---	1.5-2.5	Perched	Jan-Apr	Moderate	Low------	High.
Ba*. Beaches										
BeB---------- Belgrade	B	None--------	---	---	1.5-3.5	Apparent	Nov-Apr	High-----	Moderate	Moderate.
BuA, BuB, BuC----- Boxford	C	None--------	---	---	1.0-3.0	Apparent	Nov-Apr	High-----	High-----	Moderate.
BxB*: Boxford----------	C	None--------	---	---	1.0-3.0	Apparent	Nov-Apr	High-----	High-----	Moderate.
Urban land.										
CaB, CaC, CbB, CbC, CbD, CcB, CcC, CcD, CcE---- Canton	B	None--------	---	---	>6.0	---	---	Low------	Low------	High.
ChC*: Canton----------	B	None--------	---	---	>6.0	---	---	Low------	Low------	High.
Urban land.										
CrC*, CrD*: Chatfield--------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Moderate.
Hollis----------	C/D	None--------	---	---	>6.0	---	---	Moderate	Low------	High.
Rock outcrop.										
De---------- Deerfield	B	None--------	---	---	1.5-3.0	Apparent	Dec-Apr	Moderate	Low------	High.
Du*. Dumps										
ElA, ElB---------- Elmridge	C	None--------	---	---	1.5-3.0	Perched	Nov-May	High-----	Moderate	Moderate.
FF. Fluvaquents										
Fm---------- Freetown	D	None--------	---	---	0-1.0	Apparent	Jan-Dec	High-----	High-----	High.
Fp---------- Freetown	D	None--------	---	---	+3-0	Apparent	Jan-Dec	High-----	High-----	High.
HfA, HfB, HfC, HfD, HfE--------- Hinckley	A	None--------	---	---	>6.0	---	---	Low------	Low------	High.
HuC*: Hollis----------	C/D	None--------	---	---	>6.0	---	---	Moderate	Low------	High.
Urban land.										
Rock outcrop.										

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
ScA---------- Scitico	C	None--------	---	---	0-1.0	Perched	Nov-May	High-----	High-----	Moderate.
SgB, ShB, ShC, SmB, SoB, SoC---- Scituate	C	None--------	---	---	1.5-3.0	Perched	Nov-May	Moderate	Low------	High.
SpA, SpB---------- Shaker	C	None--------	---	---	0-1.5	Perched	Nov-May	High-----	Moderate	Moderate.
SrA, SrB---------- Sudbury	B	None--------	---	---	1.5-3.0	Apparent	Dec-Apr	Moderate	Low------	High.
Ss---------- Swansea	D	None--------	---	---	0-1.0	Apparent	Jan-Dec	High-----	High-----	High.
UAC. Udipsamments										
UD. Udorthents										
Ur*. Urban land										
WaA, WaB---------- Walpole	C	None--------	---	---	0-1.0	Apparent	Nov-Apr	High-----	Low------	High.
We---------- Wareham	C	None--------	---	---	0-1.5	Apparent	Sep-Jun	Moderate	Moderate	High.
Wf---------- Whately Variant	D	None--------	---	---	0-1.0	Apparent	Nov-Jun	High-----	High-----	High.
Wh---------- Whitman	D	None--------	---	---	+1-0.1	Perched	Sep-Jun	High-----	High-----	High.
WnA, WnB, WnC, WnD---------- Windsor	A	None--------	---	---	>6.0	---	---	Low------	Low------	High.
WrB, WrC, WsB, WsC, WsD---------- Woodbridge	C	None--------	---	---	1.5-3.0	Perched	Nov-May	High-----	Low------	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

STANDARD 4
TOTAL SUSPENDED SOLIDS ANALYSIS

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: PROPOSED WSI

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
DEEP SUMP CATCH BASIN	25%	1.00	.25	.75
OIL-GRIT SEPARATOR	25%	.75	.1875	.LL
INFILTRATION BASIN	80%	.LL	.528	.03

Total TSS Removal = 97%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: NEW MEADOWS
Prepared By: J+M
Date: 10/08

*Equals remaining load fro previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

EASTERN LAND SURVEY ASSOCIATES, INC.
Christopher R. Mello PLS
104 Lowell Street
PEABODY, MA 01960
(978) 531-8121

JOB The Meadows

SHEET NO. _____ OF _____

CALCULATED BY JHM DATE 10/08

CHECKED BY _____ DATE _____

SCALE _____

SIZING CALCULATION
WATER QUALITY INLET (OIL/GRIT SEPARATOR)

REQUIRED VOLUME = 400 CF / IMPERVIOUS ACRE

INFLOW = 0.29 IMPERVIOUS ACRE.

V = 400 X .29 = 116 CF. REQUIRED

PROPOSED VOLUME IN FIRST 2 CHAMBERS = 247 CF OK

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: FLOW FROM CATCH BASINS 4+90

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
DEEP SUMP CATCH BASIN	25%	1.00	1.00 X .25 = .25	.75
STORMCEPTOR.	77%		.75 X .77 = .5775	.1725

Total TSS Removal =

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: THE MEADOWS.
Prepared By: JWM / GSD
Date: 10/08

*Equals remaining load fro previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

3-60

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(978) 531-8121

JOB THE MEADOWS
SHEET NO. _____ OF _____
CALCULATED BY JHM DATE 10/08
CHECKED BY _____ DATE _____
SCALE _____

STORMCEPTOR SIZING CALCULATIONS

LOCATION: CATCH BASIN OUTLET STA. 4+90.

TRIBUTARY IMPERVIOUS AREA: 0.66 ACRES

STORMCEPTOR SIZE FOR 77% TSS REMOVAL PER DEP FACT SHEET: STC 1200

Stormceptor Model Number	Maximum Impervious Area (acres)	
	77% TSS removal	52% TSS removal
STC 900	0.45	0.9
STC 1200	0.7	1.45
STC 1800	1.25	2.55
STC 2400	1.65	3.35
STC 3600	2.6	5.3
STC 4800	3.6	7.25
STC 6000	4.6	9.25
STC 7200	5.55	11.25

CALCULATE REQUIRED FLOW RATE (TO BE DETERMINED AND VERIFIED BY SYSTEM MANUFACTURER).

WATER QUALITY VOLUME REQUIRED = .5" (DEPTH)
AVERAGE STORM INTENSITY = .76"/HR.
TRIBUTARY IMPERVIOUS AREA = 0.66 AC.

Qrd =
(REQUIRED FLOW THROUGH STORMCEPTOR WITH NO BYPASS): .66 Ac × 43,560 SF × $\frac{.5"}{12"/FT}$ × .76" × $\frac{1 HR}{3600 SEC.}$

= .25 CFS

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: FLOW FROM CATCH BASINS 7+68

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
DEEP SUMP CATCH BASIN	25%	1.00	1.00 X .25 = .25	.75
STORMCEPTOR.	77%		.75 X .77 = .5775	.1725

Total TSS Removal =

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: THE MEADOWS.
Prepared By: JHM/ESD
Date: 10/08

*Equals remaining load fro previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

EASTERN LAND SURVEY ASSOCIATES, INC.
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104 Lowell Street
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(978) 531-8121

JOB The Meadows
SHEET NO. _____ OF _____
CALCULATED BY JNM DATE 10/08
CHECKED BY _____ DATE _____
SCALE _____

STORMCEPTOR SIZING CALCULATIONS

LOCATION: CATCH BASIN OUTLET STATION 7+68

TRIBUTARY IMPERVIOUS AREA .21 Ac.

STORMCEPTOR SIZE FOR 77% TSS REMOVAL PER DEP FACT SHEET: STC 900

Stormceptor Model Number	Maximum Impervious Area (acres)	
	77% TSS removal	52% TSS removal
STC 900	0.45	0.9
STC 1200	0.7	1.45
STC 1800	1.25	2.55
STC 2400	1.65	3.35
STC 3600	2.6	5.3
STC 4800	3.6	7.25
STC 6000	4.6	9.25
STC 7200	5.55	11.25

CALCULATE REQUIRED FLOW RATE (TO BE DETERMINED AND VERIFIED BY SYSTEM MANUFACTURER).

WATER QUALITY VOLUME REQUIRED = 1/2" (DEPTH)
AVERAGE STORM INTENSITY = .76"/HR.
TRIBUTARY IMPERVIOUS AREA = .21 Ac.

Q_{rd} = .21 Ac x 43560 x (.5"/12") x .76" x 1/3600
(REQUIRED FLOW THROUGH STORMCEPTOR WITH NO BYPASS) = .08 CFS

PIPED DRAINAGE FACILITIES ANALYSIS

EASTERN LAND SURVEY ASSOCIATES, INC.
Christopher R. Mello PLS
104 Lowell Street
PEABODY, MA 01960
(508) 531-8121

JOB THE MEADOWS - TOPSFIELD
SHEET NO. 1 OF
CALCULATED BY JHM DATE 10/08
CHECKED BY DATE
SCALE

STORM DRAINAGE COMPUTATIONS
Based upon Rational Formula
Q = CiA

LOCATION MAIN DRIVEWAY
DESIGN STORM 10 YEAR
MANNING "n" 0.012 FOR HDPE

MANHOLE to MANHOLE	PEAK RUNOFF COMPUTATION: INCREMENTAL AREA Acres	TOTAL AREA A Acres	RUNOFF COEFFICIENT	INLET CONCENTRATION TIME Minutes	INTENSITY i In./Hr.	RUNOFF Q CFS	HYDRAULIC COMPUTATION: SLOPE %	PIPE DIAMETER In.	CAPACITY CFS	FULL VELOCITY FPS	ACTUAL VELOCITY FPS
100 TO 103	.30	.30	.64	10	4.6	.88	.004	12	2.44	3.11	2.8
102 TO 103	.29	.29	.50	10	4.6	.67	.004	12	2.44	3.11	2.6
103 TO Basin	-0-	.59	.57	10	4.6	1.55	.006	12	2.99	3.81	3.8
104 TO 105	1.1	1.1	.65	10	4.6	3.29	.01	12	3.86	4.91	5.5
106 TO 107	.28	.28	.75	10	4.6	.97	.01	12	3.86	4.91	3.9

See Page 3-6c For Pipe calculations.
See Page 3.67 For Sample velocity calculation

EASTERN LAND SURVEY ASSOCIATES, INC.
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(508) 531-8121

JOB THE MEADOWS - TOPSFIELD
SHEET NO. 2 OF
CALCULATED BY JHM DATE 10/08
CHECKED BY DATE
SCALE

STORM DRAINAGE COMPUTATIONS
Based upon Rational Formula
Q = CiA

LOCATION Golf Course Parking Lot.
DESIGN STORM 10 YEAR
MANNING "n" 0.012 FOR HDPE

MANHOLE to MANHOLE	PEAK RUNOFF COMPUTATION: INCREMENTAL AREA (Acres)	TOTAL AREA A (Acres)	RUNOFF COEFFICIENT	INLET CONCENTRATION TIME (Minutes)	INTENSITY i (In./Hr.)	RUNOFF Q (CFS)	HYDRAULIC COMPUTATION: SLOPE (%)	PIPE DIAMETER (In.)	CAPACITY (CFS)	FULL VELOCITY (FPS)	ACTUAL VELOCITY (FPS)
201 - 204				-			.5	12	2.73	3.47	-
202 - 204							.7	12	3.23	4.11	-
203 - 204							.4	12	2.44	3.11	-
204 - 205	From Page 3-37 using TR-55 (10 year).					2.14	1.0	12	3.84	4.91	5.0
206 - 207	From Page 3-40					1.42	.4	12	2.44	3.11	3.2
207 - 208	From Page 3-45 using TR-55.					2.95	.3	18	6.23	3.53	3.4

Flow coefficients are greater than assumed adequate

See Page 3-46 for Pipe Calculations
See Page 3-47 for Sample Velocity Calculation

STORM DRAIN CAPACITIES

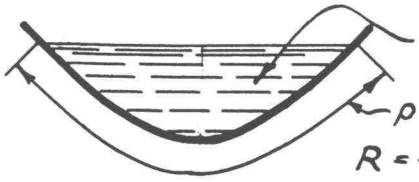
THE MEADOWS - TOPSFIELD, MA.

Sewer Pipes -- English Units

Civil Tools for Windows
(10-30-2008, 09:56:07)

Flowrate (cfs)	Diameter (in)	Friction ()	Slope (%)	Velocity (fps)
2.44	12.00	0.012	0.40	3.11
2.99	12.00	0.012	0.60	3.81
3.86	12.00	0.012	1.00	4.91
2.73	12.00	0.012	0.50	3.47
3.23	12.00	0.012	0.70	4.11

Flowrate (cfs)	Diameter (in)	Friction ()	Slope (%)	Velocity (fps)
6.23	18.00	0.012	0.30	3.53

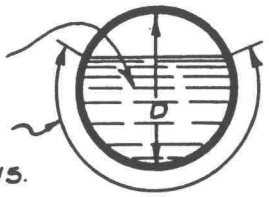


a = Cross-sectional area of waterway

p = wetted perimeter

$R = \frac{a}{p}$ = Hydraulic radius.

SECTION OF ANY OPEN CHANNEL



For pipes full or half-full $R = \frac{D}{4}$

SECTION OF CIRCULAR PIPE

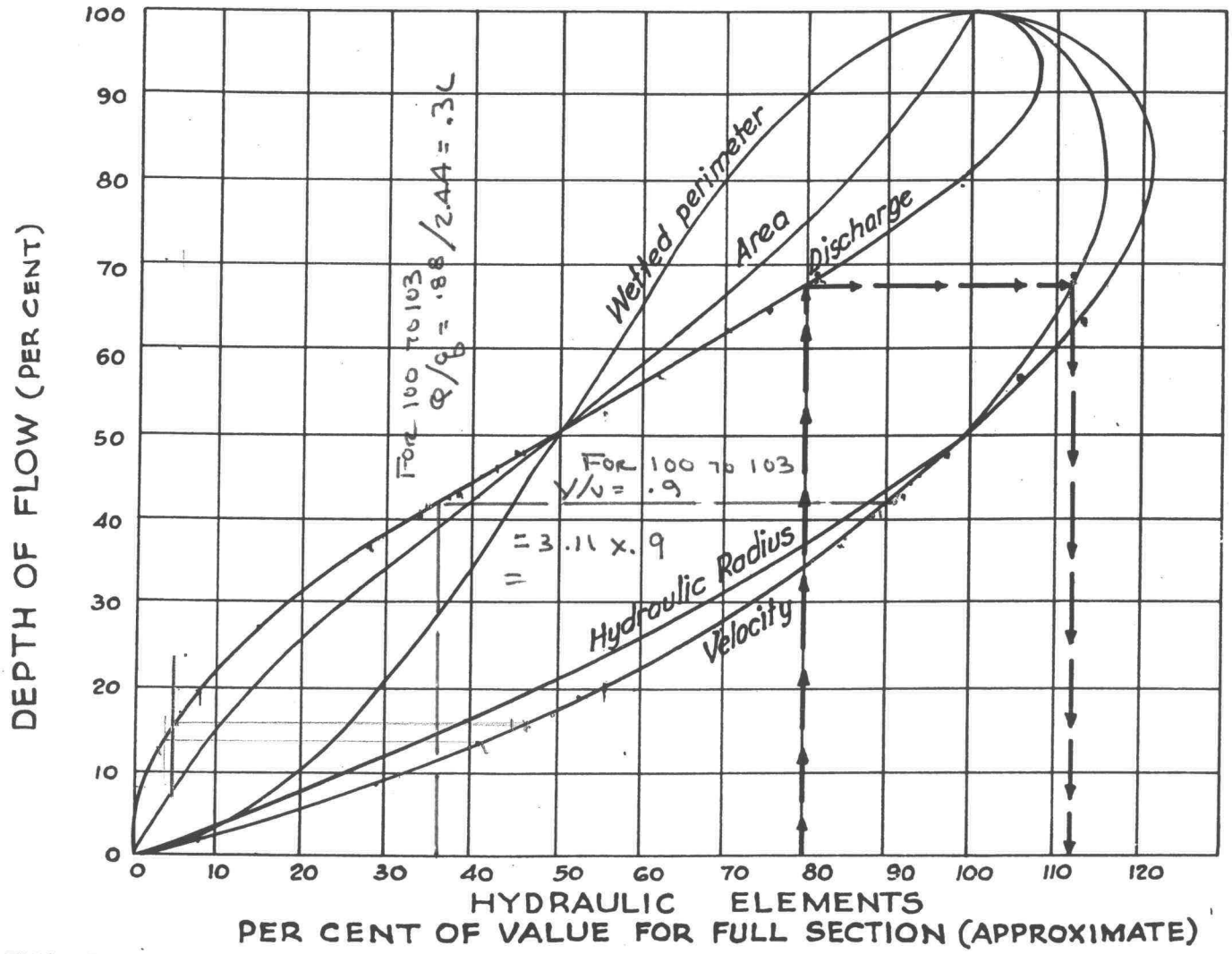
V = Average or mean velocity in feet per second.

Q = a V = Discharge of pipe or channel in cubic feet per second (c.f.s.).

n = Coefficient of roughness of pipe or channel surface, see Table A-Pg.18-68.

S = Slope of Hydraulic Gradient (water surface in open channels or pipes not under pressure, same as slope of channel or pipe invert only when flow is uniform in constant section.

FIG. A - HYDRAULIC ELEMENTS OF CHANNEL SECTIONS.



EXAMPLE: Given: Discharge = 12 c.f.s. through a pipe which has capacity flowing full of 15 c.f.s. at a velocity of 7.0 ft. per sec. Required to find V for Q = 12 c.f.s. ∴ Percentage of full discharge = $\frac{12}{15}$ = 80%. Enter chart at 80% of value for full section of Hydraulic Elements, find V = 112.5% × 7 = 7.9 ft. per sec.

FIG. B - VALUES OF HYDRAULIC ELEMENTS OF CIRCULAR SECTION FOR VARIOUS DEPTHS OF FLOW.

SECTION 4
ADDITIONAL SUBMISSIONS

STORMWATER POLLUTION PREVENTION PLAN

Stormwater Pollution Prevention Plan

for:

The Meadows
30 Wildes Road
Topsfield, MA. 01983

Operator(s):

New Meadows Enterprises, LLC
Frank Iovanella
5 Turnpike Road
Ipswich, MA. 01938
978-887-3100

SWPPP Contact(s):

Eastern Land Survey Associates, Inc.
James H. MacDowell/Clayton A. Morin, PE
104 Lowell Street
Peabody, MA. 01960
978-531-8121
978-531-5920
jimelsai@verizon.net

SWPPP Preparation Date:

September 2008

Estimated Project Dates:

Project Start Date: 03/15/2009
Project Completion Date: 12/ 31 /2012

Contents

SECTION 1: SITE EVALUATION, ASSESSMENT, AND PLANNING

1.1 Project/Site Information

Instructions:

- In this section, you can gather some basic site information that will be helpful to you later when you file for permit coverage.
- For more information, see *Developing Your Stormwater Pollution Prevention Plan: A SWPPP Guide for Construction Sites* (also known as the *SWPPP Guide*), Chapter 2
- Detailed information on determining your site's latitude and longitude can be found at www.epa.gov/npdes/stormwater/latlong

Project/Site Name: New Meadows

Project Street/Location: 30 Wildes Road

City: Topsfield State: MA ZIP Code: 01983

County or Similar Subdivision: Essex

Latitude/Longitude (Use **one** of three possible formats, and specify method)

Latitude:	Longitude:
1. 42 ° 39 . 49' N (degrees, minutes, seconds)	1.70 ° 55 ' 33" W (degrees, minutes, seconds)
2. _ _ ° _ _ . _ _ ' N (degrees, minutes, decimal)	2. _ _ ° _ _ . _ _ ' W (degrees, minutes, decimal)
3. _ _ . _ _ _ _ ° N (decimal)	3. _ _ . _ _ _ _ ° W (decimal)

Method for determining latitude/longitude:

X USGS topographic map (specify scale: 1:25,000) ☐ EPA Web site ☐ GPS

☐ Other (please specify): _____

Is the project located in Indian country? ☐ Yes X No

If yes, name of Reservation, or if not part of a Reservation, indicate "not applicable."_____

_____

Is this project considered a federal facility? ☐ Yes X No

NPDES project or permit tracking number*:_____

**(This is the unique identifying number assigned to your project by your permitting authority after you have applied for coverage under the appropriate National Pollutant Discharge Elimination System (NPDES) construction general permit.)*

1.2 Contact Information/Responsible Parties

Instructions:

- List the operator(s), project managers, stormwater contact(s), and person or organization that prepared the SWPPP. Indicate respective responsibilities, where appropriate.
- Also, list subcontractors expected to work on-site. Notify subcontractors of stormwater requirements applicable to their work.
- See *SWPPP Guide*, Chapter 2.B and EPA's Construction General Permit (CGP) Part 3, Subparts 3.2, 3.3.A, and 3.4.A.

Operator(s):

Insert Company or Organization Name: New Meadows Enterprises LLC
Insert Name: Frank Iovanella
Insert Address: 5 Turnpike Road
Insert City, State, Zip Code: Ipswich, MA. 01938
Insert Telephone Number: 978-887-3100
Insert Fax/Email:
Insert area of control (if more than one operator at site):
Repeat as necessary

Project Manager(s) or Site Supervisor(s):

Insert Company or Organization Name:
Insert Name:
Insert Address:
Insert City, State, Zip Code:
Insert Telephone Number:
Insert Fax/Email:
Insert area of control (if more than one operator at site):
Repeat as necessary

SWPPP Contact(s):

Insert Company or Organization Name: Eastern Land Survey Associates, Inc.
Insert Name: James H. MacDowell/Clayton A. Morin, P.E.
Insert Address: 104 Lowell Street
Insert City, State, Zip Code: Peabody, MA. 01960
Insert Telephone Number: 978-531-8121
Insert Fax/Email: 978-531-5920 / jimelsai@verizon.net
Insert area of control (if more than one operator at site): Site Engineer/Surveyor
Repeat as necessary

This SWPPP was Prepared by:

Insert Company or Organization Name: Eastern Land Survey Associates, Inc.
Insert Name: James H. MacDowell and Clayton A. Morin, PE
Insert Address: 104 Lowell Street
Insert City, State, Zip Code: Peabody, MA. 01960
Insert Telephone Number: 978-531-8121
Insert Fax/Email: 978-531-5920 / jimelsai@verizon.net

Subcontractor(s):

Insert Company or Organization Name:
Insert Name:
Insert Address:
Insert City, State, Zip Code:
Insert Telephone Number:
Insert Fax/Email:
Repeat as necessary

Emergency 24-Hour Contact:

Insert Company or Organization Name: New Meadows Enterprises, LLC
Insert Name: Frank Iovanella
Insert Telephone Number: 978-887-3100

1.3 Nature and Sequence of Construction Activity

Instructions:

- Briefly describe the nature of the construction activity and approximate time frames (one or more paragraphs, depending on the nature and complexity of the project).
- For more information, see *SWPPP Guide*, Chapter 3.A. and EPA's CGP Part 3, Subparts 3.3.B.1 and 2, and 3.4.A.

Describe the general scope of the work for the project, major phases of construction, etc:

The work involves the construction of 24 units of residential housing in six buildings together with ancillary driveways, utilities, stormwater management facilities, grading and landscaping. The existing parking lot serving the New Meadows Golf Course will be concurrently replaced and stormwater management facilities incorporated into the new design. The main driveway system, utilities, stormwater management system and new parking lot will be constructed first. New residential buildings will be constructed on a building by building basis in response to real estate market conditions. Grading, landscaping and stormwater facilities will be completed for the particular building concurrently with its construction.

What is the function of the construction activity?

X Residential ☐ Commercial ☐ Industrial ☐ Road Construction ☐ Linear Utility

☒ Other (please specify): New parking lot for golf course

Estimated Project Start Date: 03 / 15 / 2009

Estimated Project Completion Date: 12 / 31 / 2012

1.4 Soils, Slopes, Vegetation, and Current Drainage Patterns

Instructions:

- Describe the existing soil conditions at the construction site including soil types, slopes and slope lengths, drainage patterns, and other topographic features that might affect erosion and sediment control.
- Also, note any historic site contamination evident from existing site features and known past usage of the site.
- This information should also be included on your site maps (See *SWPPP Guide*, Chapter 3.C.).
- For more information, see *SWPPP Guide*, Chapter 3.A and EPA's CGP Part 3, Subpart 3.3.C.

Soil type(s): Hinkley, Sudbury, Canton

Slopes (describe current slopes and note any changes due to grading or fill activities):

Existing slopes on site vary from 1 to 25 percent. Proposed slopes will generally range from 1 to 33 percent.

Drainage Patterns (describe current drainage patterns and note any changes dues to grading or fill activities): The site generally drains through two ponds which are used for golf course irrigation with overflows discharging to Hobbs Brook which forms the easterly boundary of the property. The present golf course parking lot drains overland to Wildes Road and Hobbs Brook.

Vegetation: Landscaped lawn and fairway edges, wooded areas (predominantly pine with some other deciduous and coniferous varieties exist on the site).

Other:

1.5 Construction Site Estimates

Instructions:

- Estimate the area to be disturbed by excavation, grading, or other construction activities, including dedicated off-site borrow and fill areas.
- Calculate the percentage of impervious surface area before and after construction
- Calculate the runoff coefficients before and after construction.
- For more information, see *SWPPP Guide*, Chapter 3.A and EPA's CGP Part 3, Subpart 3.3.B.

The following are estimates of the construction site:

Total project area:	52.2 acres
Construction site area to be disturbed:	8 acres
Percentage impervious area before construction:	15%
Runoff coefficient before construction:	64
Percentage impervious area after construction:	
Runoff coefficient after construction:	

1.6 Receiving Waters

Instructions:

- List the waterbody(s) that would receive stormwater from your site, including streams, rivers, lakes, coastal waters, and wetlands. Describe each as clearly as possible, such as *Mill Creek, a tributary to the Potomac River*, and so on.
- Indicate the location of all waters, including wetlands, on the site map. For more information, see EPA's CGP Part 3, Subparts 3.3.B.4 and 3.3.C.6.
- Note any stream crossings, if applicable.
- List the storm sewer system or drainage system that stormwater from your site could discharge to and the waterbody(s) that it ultimately discharges to.
- If any of the waterbodies above are impaired and/or subject to Total Maximum Daily Loads (TMDLs), please list the pollutants causing the impairment and any specific requirements in the TMDL(s) that are applicable to construction sites. Your SWPPP should specifically include measures to prevent the discharge of these pollutants. For more information, see EPA's CGP Part 1, Subpart 1.3.C.5 and Part 3, Subpart 3.14.
- For more information, see *SWPPP Guide*, Chapter 3.A and 3.B.
- Also, for more information and a list of TMDL contacts and links by state, visit www.epa.gov/npdes/stormwater/tmdl.

Description of receiving waters: Hobbs Brook (east property line of site)

Description of storm sewer systems: Proposed on site system of piped catch basins and manholes and pretreatment devices, bioretention cells, infiltration BMP's.

Description of impaired waters or waters subject to TMDLs: None

Other:

1.7 Site Features and Sensitive Areas to be Protected

Instructions:

- Describe unique site features including streams, stream buffers, wetlands, specimen trees, natural vegetation, steep slopes, or highly erodible soils that are to be preserved.
- Describe measures to protect these features.
- Include these features and areas on your site maps.
- For more information, see *SWPPP Guide*, Chapter 3.A and 3.B.

Description of unique features that are to be preserved: The site of the proposed townhomes is within the New Meadows Golf Course, a public, 9 hole facility. As a part of the rezoning which was enacted by Town Meeting in 2008, the course is to remain public and open and will thus be preserved. Siting of proposed buildings has been done so as to minimize impact on the first and second fairways and maintain a setback from the existing public way.

Describe measures to protect these features:

1.8 Potential Sources of Pollution

Instructions:

- Identify and list all potential sources of sediment, which may reasonably be expected to affect the quality of stormwater discharges from the construction site.
- Identify and list all potential sources of pollution, other than sediment, which may reasonably be expected to affect the quality of stormwater discharges from the construction site.
- For more information, see *SWPPP Guide*, Chapter 3.A and EPA's CGP Part 3, Subpart 3.1.B.

Potential sources of sediment to stormwater runoff: Exposed soil surfaces during site grading, foundation and utility excavation, driveway and parking lot construction.

Potential pollutants and sources, other than sediment, to stormwater runoff:

INSERT TEXT OR USE TABLE BELOW

Trade Name Material	Stormwater Pollutants	Location
Portable Toilets	Bacteria, parasites, viruses	Staging Area
Fertilizer	Nitrogen, Phosphorous	Newly seeded areas
Asphalt	Oil, petroleum distillates	Streets and driveways
Concrete	Lime, sand, PH, chromium	Dwelling, foundations, walks
Glue, Adhesives	Polymers, epoxies	Dwelling construction
Gasoline	Benzene, Ethyl Benzene, Toluene, Xylene, MTBE	Staging Area
Diesel Fuel	Petroleum distillate, oil & grease, Naphthahlene, Xylenes	Staging Area
Hydraulic Oil/Fluids	Mineral Oil	Staging Area
Antifreeze/Coolant	Ethylene Glycol, Propylen Glycol, Heavy Metals	Staging Area

1.9 Endangered Species Certification

Instructions:

- Before beginning construction, determine whether endangered or threatened species or their critical habitats are on or near your site.
- Adapt this section as needed for state or tribal endangered species requirements and, if applicable, document any measures deemed necessary to protect endangered or threatened species or their critical habitats.
- For more information on this topic, see *SWPPP Guide*, Chapter 3.B and EPA's CGP Part 1, Subpart 1.3.C.6 and Appendix C.
- Additional information on Endangered Species Act (ESA) provisions for EPA's Construction General Permit is at www.epa.gov/npdes/stormwater/esa

Are endangered or threatened species and critical habitats on or near the project area?

☒ Yes ☐ No

Describe how this determination was made:

Massachusetts Natural Heritage Database

If yes, describe the species and/or critical habitat: Priority Habitat of Rare Species and Estimated

Habitat of Rare Wildlife east of site.

A MESA review of the project will be conducted during the Notice of Intent proceeding before the Topsfield Conservation Commission. No work is proposed in the Habitat Area.

If yes, describe or refer to documentation that determines the likelihood of an impact on identified species and/or habitat and the steps taken to address that impact. (Note, if species are on or near your project site, EPA strongly recommends that the site operator work closely with the appropriate field office of the U.S. Fish and Wildlife Service or National Marine Fisheries Service. For concerns related to state or tribal listing of species, please contact a state or tribal official.)

INSERT TEXT HERE

1.10 Historic Preservation

Instructions:

- Before you begin construction, you should review federal and any applicable state, local, or tribal historic preservation laws and determine if there are historic sites on or near your project. If so, you might need to make adjustments to your construction plans or to your stormwater controls to ensure that these historic sites are not damaged.
- For more information, see *SWPPP Guide*, Chapter 3.B or contact your state or tribal historic preservation officer.

Are there any historic sites on or near the construction site?

☐ Yes X No

Describe how this determination was made:

Massachusetts Historic Commission.

If yes, describe or refer to documentation that determines the likelihood of an impact on this historic site and the steps taken to address that impact.

INSERT TEXT HERE

1.11 Applicable Federal, Tribal, State or Local Programs

Instructions:

- Note other applicable federal, tribal, state or local soil and erosion control and stormwater management requirements that apply to the construction site. See EPA's CGP Part 3.9.

INSERT TEXT HERE

1.12 Maps

Instructions:

- Attach site maps. For most projects, a series of site maps is recommended. The first should show the undeveloped site and its current features. An additional map or maps should be created to show the developed site or for more complicated sites show the major phases of development.

These maps should include the following:

- Direction(s) of stormwater flow and approximate slopes before and after major grading activities;
- Areas and timing of soil disturbance;
- Areas that will not be disturbed;
- Natural features to be preserved;
- Locations of major structural and non-structural BMPs identified in the SWPPP;
- Locations and timing of stabilization measures;
- Locations of off-site material, waste, borrow, or equipment storage areas;
- Locations of all waters, including wetlands;
- Locations where stormwater discharges to a surface water;
- Locations of storm drain inlets; and
- Areas where final stabilization has been accomplished.
- For more information, see SWPPP Guide, Chapter 3.C and EPA's CGP Part 3, Subparts 3.1.B.1 and 3.3.C.

Include the site maps with the SWPPP. (See Appendix B).

SECTION 2: EROSION AND SEDIMENT CONTROL BMPS

Instructions:

- Describe the BMPs that will be implemented to control pollutants in stormwater discharges. For each major activity identified, do the following
  - ✓ Clearly describe appropriate control measures.
  - ✓ Describe the general sequence during the construction process in which the measures will be implemented.
  - ✓ Describe the maintenance and inspection procedures that will be used for that specific BMP.
  - ✓ Include protocols, thresholds, and schedules for cleaning, repairing, or replacing damaged or failing BMPs.
  - ✓ Identify staff responsible for maintaining BMPs.
  - ✓ (If your SWPPP is shared by multiple operators, indicate the operator responsible for each BMP.)
- Categorize each BMP under one of the following 10 areas of BMP activity as described below:
  - ***2.1 Minimize disturbed area and protect natural features and soil***
  - ***2.2 Phase Construction Activity***
  - ***2.3 Control Stormwater flowing onto and through the project***
  - ***2.4 Stabilize Soils***
  - ***2.5 Protect Slopes***
  - ***2.6 Protect Storm Drain Inlets***
  - ***2.7 Establish Perimeter Controls and Sediment Barriers***
  - ***2.8 Retain Sediment On-Site and Control Dewatering Practices***
  - ***2.9 Establish Stabilized Construction Exits***
  - ***2.10 Any Additional BMPs***
- Note the location of each BMP on your site map(s).
- For any structural BMPs, you should provide design specifications and details and refer to them. Attach them as appendices to the SWPPP or within the text of the SWPPP.
- For more information, see *SWPPP Guide*, Chapter 4 and EPA's CGP Part 3; Subparts 3.3.B.2 and 3.4.A-D, and Part 4, Subpart 4.5.
- Consult your state's design manual or one of those listed in Appendix D of the *SWPPP Guide*.
- For more information or ideas on BMPs, see EPA's National Menu of BMPs http://www.epa.gov/npdes/stormwater/menuofbmps

2.1 Minimize Disturbed Area and Protect Natural Features and Soil

Instructions:

- Describe the areas that will be disturbed with each phase of construction and the methods (e.g., signs, fences) that you will use to protect those areas that should not be disturbed. Describe natural features identified earlier and how each will be protected during construction activity. Also describe how topsoil will be preserved. Include these areas and associated BMPs on your site map(s) also. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 1.)
- Also, see EPA's *Preserving Natural Vegetation BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/perserve_veg

Existing Vegetation

BMP Description: Perimeter trees to be preserved will be clearly flagged with a distinctive color of surveyor's ribbon.

Installation Schedule:	Perimeter trees to be preserved will be clearly marked with surveyor's ribbon prior to the commencement of any work.
Maintenance and Inspection:	Trees to be preserved shall be inspected weekly.
Responsible Staff:	

Topsoil

Topsoil depths of 6" to 12" exist within landscaped and wooded areas of the site. It will be stockpiled for reuse on site.

BMP Description: Topsoil stripped from areas of proposed construction shall be stockpiled in the project staging area(s) for screening and re-use on the site. Stockpiles will be kept out of areas of concentrated runoff flow and protected from erosion by perimeter silt fencing. Stockpile surfaces shall be roughened by equipment tracking.

Installation Schedule:	Topsoil stockpiles shall be established site grading proceeds. Stockpiles will be protected with temporary erosion controls, once placed.
Maintenance and Inspection:	Stockpile areas will be inspected weekly and following storm events. Any observed areas of erosion shall be stabilized immediately.
Responsible Staff:	

2.2 Phase Construction Activity

Instructions:

- Describe the intended construction sequencing and timing of major activities, including any opportunities for phasing grading and stabilization activities to minimize the overall amount of disturbed soil that will be subject to potential erosion at one time. Also, describe opportunities for timing grading and stabilization so that all or a majority of the soil disturbance occurs during a time of year with less erosion potential (i.e., during the dry or less windy season). (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 2.) It might be useful to develop a separate, detailed site map for each phase of construction.
- Also, see EPA's *Construction Sequencing BMP Fact Sheet* at http://www.epa.gov/npdes/stormwater/menuofbmps/construction/cons_seq)

BMP Description: The proposed program of construction phasing is outlined in Appendix M.

2.3 Control Stormwater Flowing onto and through the Project

Instructions:

- Describe structural practices (e.g., diversions, berms, ditches, storage basins) including design specifications and details used to divert flows from exposed soils, retain or detain flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 3.)

The only runoff crossing the work area toward Hobbs Brook is that generated by the site itself. See Section 2.8.

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

Repeat as needed

2.4 Stabilize Soils

Instructions:

- Describe controls (e.g., interim seeding with native vegetation, hydroseeding) to stabilize exposed soils where construction activities have temporarily or permanently ceased. Also describe measures to control dust generation. Avoid using impervious surfaces for stabilization whenever possible. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 4, EPA's CGP Part 3, Subpart 3.13.D.)
- Also, see EPA's *Seeding BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/seeding

Temporary Stabilization:

BMP Description: Hydroseeding will be utilized for temporary stabilization of any areas where construction is to be ceased for more than 14 days. The hydroseed mix shall consist of wood fibers, seed (slope mix), fertilizer and stabilizing emulsion. Application rates shall be at a rate of 8 lbs. per acre. Seeding will be performed at times of the year when vegetation is more likely to be established. Any areas requiring winter stabilization shall be hydroseeded no later than October 1st.

☐ *Permanent*	☒ *Temporary*
Installation Schedule:	Temporary stabilization will be applied to areas of the site where activity will temporarily cease for more than 14 days.
Maintenance and Inspection:	Stabilized areas shall be inspected weekly and following storm events. Until dense vegetation has established, any bare areas shall be reseeded, fertilized and mulched or re-hydroseeded.
Responsible Staff:	

BMP Description: Permanent stabilization shall be done upon final grading of soil-surfaced landscaped areas, but in no case more than 14 days after completion following placement and grading of topsoil.

Final seeding of landscaped areas shall be done mechanically, by hydroseeding or sodded. Seed mix shall be as specified by the landscape contractor and approved by the Developer. Trees and shrubs shall be native, non-invasive species and shall be installed in accordance with the nursery suppliers recommendations.

☒ ***Permanent***	☐ ***Temporary***
Installation Schedule:	Permanent stabilization shall be done within 14 days following the completion of all other site activities, except final paving.
Maintenance and Inspection:	All newly landscaped areas shall be inspected weekly and following storm events. Any areas of failure shall be re-landscaped immediately. Permanently stabilized areas shall be monitored until final stabilization's attained.
Responsible Staff:	

Repeat as needed

2.5 Protect Slopes

Instructions:

- Describe controls (e.g., erosion control blankets, tackifiers) including design specifications and details that will be implemented to protect all slopes. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 5.)
- Also, see EPA's *Geotextiles BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/geotextiles

Detention Basins

BMP Description: Geotextile erosion control blankets will be used to stabilize slopes in areas which are steeper than 3 to 1 and proposed to be grassed surface. The entire slope shall be covered with the blanket following final grading and installation of seed, fertilizer and mulch. The leading edge of the blanket will be anchored in a 12 inch deep by 6 inch wide trench on the uphill side of the slope. The blanket will be rolled slowly downslope and stapled at 12 inch intervals. If multiple blankets are used, they shall be overlapped a minimum of two inches and stapled along the overlapped edge.

If there are conflicts between the above installation procedures and the manufacturer's recommendations, the manufacturer's procedures shall be followed.

Installation Schedule:	Erosion control blankets shall be installed once slopes have been graded and seeded.
Maintenance and Inspection:	Erosion control blankets shall be inspected weekly and immediately following storm events. If any cracks, tears or breaches are observed, the section shall be replaced immediately. Any areas where the blanket is not in close contact with the ground will be repaired or replaced. Inspection and maintenance will continue until permanent vegetative stabilization of the slope has occurred.
Responsible Staff:	

Dust Control

BMP Description: Dust shall be controlled by wetting with water using a pressure distribution truck or sprinklers. Only potable water shall be used, the source of which shall be approved by the Town of Topsfield. The typical application rate shall be 500 gallons per acre and minimized to avoid ponding or runoff generation.

Installation Schedule:	Dust control will be performed as needed during site grading operations and during dry windy conditions (actual or forecast winds of greater than 20 miles per hour). Spraying of potable water shall not be done more than 3 times daily in June-September nor more than once daily at other times unless site or climatic conditions demand otherwise.
Maintenance and Inspection:	At least one pressure distribution dewatering truck shall be kept available to site. The truck shall have a positive shutoff valve to prevent excessive watering.
Responsible Staff:	

2.6 Protect Storm Drain Inlets

Instructions:

- Describe controls (e.g., inserts, rock-filled bags, or block and gravel) including design specifications and details that will be implemented to protect all inlets receiving stormwater from the project during the entire project. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 6.)
- Also, see EPA's *Storm Drain Inlet Protection BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/storm_drain

Storm Drain Inlet Protection prior to Paving

BMP Description: A siltation barrier shall be installed around catch basin inlets. The barrier will consist of properly anchored haybale and stone filters. As an alternative, an impervious membrane may be installed beneath the catch basin grating.

Installation Schedule:	Once catch basins have been constructed, a silt barrier shall be installed around each one until pavement base course has been placed.
Maintenance and Inspection:	See Section 2, Part 2.7.
Responsible Staff:	

Storm Drain Inlet Protection after Pavement Construction

BMP Description: Silt barriers made of haybales and filter stone shall be installed to protect each catch basin.

Installation Schedule:	Silt protection shall be installed once the base course of pavement has been constructed and removed just prior to installation of the top course of pavement.
Maintenance and Inspection:	Silt protection BMP's will be inspected weekly and immediately following storm events. If external barriers are used, silt will be removed when it reaches 1/3 the height (or capacity) of the barrier.
Responsible Staff:	

2.7 Establish Perimeter Controls and Sediment Barriers

Instructions:

- Describe structural practices (e.g., silt fences or fiber rolls) including design specifications and details to filter and trap sediment before it leaves the construction site. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 7.)
- Also see, EPA's *Silt Fence BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/silt_fences or *Fiber Rolls BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/fiber_rolls

Silt Fence

BMP Description: Silt fences shall be installed prior to construction, as shown on the Site Plan, except at the project construction entrance. Silt fences will consist of staked haybales and fabric fencing, silt socks or other acceptable best management practices.

Installation Schedule:	Silt fences will be installed prior to commencement of any other site work. Soil stockpiles will be protected with silt barriers once established.
Maintenance and Inspection:	Silt fences will be inspected weekly and immediately after storm events. Any gaps or breaches will be repaired or replaced immediately. Accumulated sediment will be removed if it reaches one third the height of the silt fence and disposed of lawfully. Accumulated sediments will be removed from the project area following final stabilization but prior to removal of silt fences.
Responsible Staff:	

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

Repeat as needed

2.8 Retain Sediment On-Site

Instructions:

- Describe sediment control practices (e.g., sediment trap or sediment basin), including design specifications and details (volume, dimensions, outlet structure) that will be implemented at the construction site to retain sediments on-site. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 8 or EPA's CGP Part 3.13.E.)
- Also, see EPA's *Sediment Basin BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/sediment_basins

Sediment Traps

BMP Description: Sediment traps shall be constructed on an as-needed basis and at locations upgradient of stormwater discharges and maintained until exposed areas are permanently stabilized. Sediment traps shall have a minimum volume of 1,800 cubic feet per contributing acre, a length to width ratio of 2 to 1 and 2 to 1 side slopes. The outlet shall be constructed of ¾" filter stone. The spillway width shall be 4 feet plus 2 feet for each acre over 1.

Installation Schedule:	Sediment traps shall be constructed prior to commencement of earth removal or placement in any areas where runoff will discharge.

Maintenance and Inspection:	Sediment traps shall be inspected weekly and immediately following storm events. Sediment traps shall be cleaned out when sediment depth reaches one third of the height of the stone filter. Clogging of stone filters, as evidenced by standing water in the trap more than 24 hours after storm events, shall be replaced.
Responsible Staff:	

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

Repeat as needed

2.9 Establish Stabilized Construction Exits

Instructions:

- Describe location(s) of vehicle entrance(s) and exit(s), procedures to remove accumulated sediment off-site (e.g., vehicle tracking), and stabilization practices (e.g., stone pads or wash racks or both) to minimize off-site vehicle tracking of sediments and discharges to stormwater. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 9 and EPA's CGP Part 3, Subparts 3.4.G and 3.13.B.)
- Also, see EPA's *Construction Entrances BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/cons_entrance

Stabilized Construction Entrances before Pavement Installation

BMP Description: Stone anti-tracking pads shall be constructed at all points of access to and/or egress from the site in order to prevent tracking of sediment onto adjacent ways by construction vehicles. Stabilized entrances shall be a minimum of 40 feet long, 10 feet wide and flared at the point of entry onto paved roads. The entrance shall be constructed of a minimum depth of 6 inches of 1 ½ to 3 in crushed stone. Signage directing construction vehicles to use the anti-tracking pad shall be posted.

Installation Schedule:	Stone anti-tracking pads will be installed at any location from which construction traffic will pass between the site and adjacent paved ways prior to any other construction activities and will remain in place until the base course of pavement is installed.
Maintenance and Inspection:	The stabilized construction entrance shall be inspected weekly and following storm events. The anti-tracking pad shall be maintained such that sediment is not tracked off-site. Any sediment transported onto adjacent ways will be swept up immediately and removed to a lawful disposal location. If the

	anti-tracking pad becomes clogged and is no longer functioning efficiently, it will be top-pressed with new stone or replaced. The pad shall be kept shaped as necessary for drainage and runoff control.
Responsible Staff:	

Stabilized Construction Entrances after Pavement Installation

BMP Description: After pavement installation, a metal rumble pad will be placed at construction exits to shake sediment from vehicle tires until all disturbed areas are permanently stabilized. The pad shall have a minimum length of 24 feet.

Installation Schedule:	Rumble pads shall be installed at construction entrances immediately following the installation of pavement base courses connecting to existing paved ways.
Maintenance and Inspection:	Rumble pads will be installed weekly and following storm events. Any sediment buildup will be removed by sweeping.
Responsible Staff:	

Repeat as needed

2.10 Additional BMPs

Instructions:

- Describe additional BMPs that do not fit into the above categories.

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

Repeat as needed

SECTION 3: GOOD HOUSEKEEPING BMPS

Instructions:

- Describe the key good housekeeping and pollution prevention (P2) measures that will be implemented to control pollutants in stormwater.
- Categorize each good housekeeping and pollution prevention (P2) BMP under one of the following seven categories:
  - ***3.1 Material Handling and Waste Management***
  - ***3.2 Establish Proper Building Material Staging Areas***
  - ***3.3 Designate Washout Areas***
  - ***3.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices***
  - ***3.5 Allowable Non-Stormwater Discharges and Control Equipment/Vehicle Washing***
  - ***3.6 Spill Prevention and Control Plan***
  - ***3.7 Any Additional BMPs***
- For more information, see *SWPPP Guide*, Chapter 5 and EPA's CGP Part 3, Subparts 3.4.(F), (G), (H), and (I).
- Consult your state's design manual or resources in Appendix D of the *SWPPP Guide*.
- For more information or ideas on BMPs, see EPA's National Menu of BMPs http://www.epa.gov/npdes/stormwater/menuofbmps

3.1 Material Handling and Waste Management

Instructions:

- Describe measures (e.g., trash disposal, sanitary wastes, recycling, and proper material handling) to prevent the discharge of solid materials to receiving waters, except as authorized by a permit issued under section 404 of the CWA (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 1.)
- Also, see EPA's *General Construction Site Waste Management BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/cons_wasteman

Waste Materials

All waste material storage areas and portable toilets shall be located 100 feet or more from wetland resource areas.

BMP Description: All waste materials will be gathered daily and disposed of into metal trash dumpsters located on site. At least one dumpster shall be located on the project at all times. Other dumpsters shall be located in accordance with the project needs. Only construction debris and trash shall be deposited in dumpsters. All construction personnel will be instructed as to the permitted procedures for waste material disposal. The procedures shall be posted, in writing, at the site superintendent's office trailer. The site superintendent shall be responsible for seeing

that practices are followed.	
Installation Schedule:	Trash dumpsters shall be installed on site upon commencement of work.
Maintenance and Inspection:	The dumpsters will be inspected weekly and immediately following storm events. Dumpsters shall be emptied weekly by private contractor and disposed of at an approved location. If trash load exceeds this schedule, dumpsters will be emptied more frequently.
Responsible Staff:	

Hazardous Waste

BMP Description: Any hazardous waste materials such as oil filters, petroleum products, paint, solvents and equipment maintenance fluids will be stored in sealed original labeled containers in a designated hazardous materials storage area. Storage of such materials will be on spill pallets or in enclosed site containers. Such materials will not be disposed of in dumpsters. Disposal of hazardous materials shall be in accordance with all applicable Local, State and Federal regulations.

All construction personnel will be instructed as to the permitted procedures for waste material disposal. The procedures shall be posted, in writing, at the site superintendent's office trailer. The site superintendent shall be responsible for seeing that practices are followed.

Installation Schedule:	A hazardous waste storage area will be designated at commencement of work.
Maintenance and Inspection:	Hazardous material storage areas shall be inspected weekly and following storm events. Storage area(s) shall be kept well organized, clean and equipped with sufficient cleanup supplies as required for the materials being stored. Material inventories, material safety data sheets and emergency contact numbers shall be maintained in the site superintendent's office trailer.
Responsible Staff:	

Sanitary Waste

BMP Description: Temporary sanitary facilities (portable toilets) will be provided on site. Portable toilets will not be located in concentrated flow paths or traffic areas. Collection pans will be provided beneath toilets as a secondary containment mechanism.

Installation Schedule:	Upon commencement of work.
Maintenance and Inspection:	Sanitary waste shall be collected by private contractor in accordance with their customary collection schedule. Toilets will be inspected by that contractor on a weekly basis for evidence of leaking holding tanks. Any toilets with leaking tanks shall be

	removed immediately from the site.
Responsible Staff:	

Recycling

BMP Description: Recyclable construction scrap such as pallets, cardboard and other recyclable containers shall be disposed of in a designated recycling dumpster. The dumpster shall have a secure water tight cover and be placed in the staging area away from runoff flow paths.

All construction personnel will be instructed as to the permitted procedures for waste material disposal. The procedures shall be posted, in writing, at the site superintendent's office trailer. The site superintendent shall be responsible for seeing that practices are followed.

Installation Schedule:	The designated recycling dumpster shall be installed upon commencement of work.
Maintenance and Inspection:	The recycling dumpster shall be inspected weekly and following storm events. The recycling dumpster will be emptied when filled, but in no case less than monthly.
Responsible Staff:	

3.2 Establish Proper Building Material Staging Areas

Instructions:

- Describe construction materials expected to be stored on-site and procedures for storage of materials to minimize exposure of the materials to stormwater. (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 2 and EPA's CGP Part 3.4.H.)

Project Staging Area

BMP Description: Construction equipment and maintenance supplies will be stored in the project staging area. Hand tools, small parts and the like will be stored in a site shed, water tight shipping container or trailer. Hazardous materials shall be stored as described in Section 3.1.

Soil stockpiles will be maintained in the project staging area until such are distributed in connection with site grading activities. Stockpiles will not be placed in areas of runoff concentration and will be protected with erosion control BMP's.

Materials used in connection with site utility construction, such as pipe, manholes and fittings, shall be stored in the project staging area. Lumber and other building materials used to construct new dwellings shall be stored on wood blocks in order to minimize contact with surface runoff.

Installation Schedule:	The project staging and materials storage area will be installed

	prior to commencement of other site activities and expanded in accordance with the project demands. Materials storage areas for each building will be designated following rough grading and foundation construction.
Maintenance and Inspection:	Storage areas will be inspected weekly and following storm events. Perimeter controls, covers and liners will be repaired or replaced as needed to maintain proper functioning. Storage areas will be kept in an organized manner.
Responsible Staff:	

3.3 Designate Washout Areas

Instructions:

- Describe location(s) and controls to eliminate the potential for discharges from washout areas for concrete mixers, paint, stucco, and so on. (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 3.)
- Also, see EPA's *Concrete Washout BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/concrete_wash

Concrete Washout

BMP Description: A designated temporary below grade concrete washout area will be established prior to commencement of foundation construction. The washout area will be a minimum of 10 feet square and 3 feet deep, lined with a 10 mil thick impervious liner. Concrete delivery operators will be advised of the washout area location.

Concrete washout areas shall not be located in runoff paths within 100 feet of wetland resource areas nor within 50 feet of catch basins. Concrete will not be placed nor trucks washed out during or immediately prior to an anticipated rainfall event. Excess concrete and washout slurry will be discharged into the designated washout area or removed from the site. When a washout area is no longer needed, it will be cleaned out, materials removed and disposed of as described below, backfilled, graded and stabilized.

Installation Schedule:	A washout area will be constructed prior to commencement of foundation installation.
Maintenance and Inspection:	Washout areas shall be inspected daily when concrete deliveries are occurring. Inspection shall include liner stability, proper use of washout area and cleanout when the area is filled to 75 percent of its capacity.
Responsible Staff:	

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

Repeat as needed

3.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices

Instructions:

- Describe equipment/vehicle fueling and maintenance practices that will be implemented to control pollutants to stormwater (e.g., secondary containment, drip pans, and spill kits) (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 4.)
- Also, see EPA's *Vehicle Maintenance and Washing Areas BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/vehicile_maintain

Equipment Fueling and Maintenance

BMP Description:	
Installation Schedule:	Equipment and vehicle maintenance and fueling practices will be implemented at the time of commencement of construction activities. Only routine maintenance activities will be performed on site.
Maintenance and Inspection:	
Responsible Staff:	
BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

Repeat as needed

3.5 Control Equipment/Vehicle Washing

Instructions:

- Describe equipment/vehicle washing practices that will be implemented to control pollutants to stormwater. (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 5.)
- Also, see EPA's *Vehicle Maintenance and Washing Areas BMP Fact Sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/vehicile_maintain

Equipment/Vehicle Washing

BMP Description: No equipment or vehicle washing will be done on-site.	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

Repeat as needed

3.6 Spill Prevention and Control Plan

Instructions:

- Describe the spill prevention and control plan to include ways to reduce the chance of spills, stop the source of spills, contain and clean up spills, dispose of materials contaminated by spills, and train personnel responsible for spill prevention and control. (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 6 and EPA's CGP Parts 4.3 and 4.4.)
- Also, see EPA's *Spill Prevention and Control Plan BMP Fact sheet* at www.epa.gov/npdes/stormwater/menuofbmps/construction/spill_control

a. Employee Training – all employees will be trained as to procedures to be followed relative to spill prevention and control.

b. Vehicle Maintenance – major vehicle and equipment maintenance will be accomplished off site. Vehicles and equipment will be checked for leaking oil, fuel or other fluids. Such leaks

shall be repaired immediately.

c. Hazardous Material Storage – hazardous materials shall be stored in accordance with Section 3.1 and all applicable regulatory requirements.

3.7 Any Additional BMPs

Instructions:

- Describe any additional BMPs that do not fit into the above categories. Indicate the problem they are intended to address.

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

Repeat as needed

3.8 Allowable Non-Stormwater Discharge Management

Instructions:

- Identify all allowable sources of non-stormwater discharges that are not identified. The allowable non-stormwater discharges identified in Part 1.3.B of EPA's CGP include
  - ✓ Discharges from fire-fighting activities
  - ✓ Fire hydrant flushings
  - ✓ Waters used to wash vehicles where detergents are not used
  - ✓ Water used to control dust in accordance with EPA's CGP, Part 3, Subpart 3.4.G
  - ✓ Potable water including uncontaminated water line flushings
  - ✓ Routine external building wash down that does not use detergents
  - ✓ Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used
  - ✓ Uncontaminated air conditioning or compressor condensate
  - ✓ Uncontaminated ground water or spring water
  - ✓ Foundation or footing drains where flows are not contaminated with process materials such as solvents
  - ✓ Uncontaminated excavation dewatering
  - ✓ Landscape irrigation
- Identify measures used to eliminate or reduce these discharges and the BMPs used to prevent them from becoming contaminated.
- For more information, see *SWPPP Guide*, Chapter 3.A or EPA's CGP Part 1.3.B and 3.5.

List allowable non-stormwater discharges and the measures used to eliminate or reduce them and to prevent them from becoming contaminated:

Any changes in construction activities that produce other allowable non-stormwater discharges will be identified, and the SWPPP will be amended and the appropriate erosion and sediment control will be implemented.

Water Used to Control Dust

BMP Description: Dust control will be implemented as needed once site grading has been initiated and during windy conditions (forecasted or actual wind conditions of 20 mph or greater) while site grading is occurring. See Section 2.5.

Responsible Staff:	

Uncontaminated Excavation Dewatering

BMP Description: Discharges from uncontaminated excavation dewatering activities shall be into a dewatering basin, detailed on Sheet 13 of the Plan. Basins shall be a minimum of 8 feet in diameter and 2 feet in depth. The stone surface shall be a minimum of 6 inches below adjacent ground elevation

Responsible Staff:	

Watering of Landscape Areas

BMP Description: Irrigation water will not be sprayed onto impervious surfaces. Watering of lawns and planting beds shall be done with hoses and sprinklers or soaker hoses. Irrigated areas will be checked for excess watering.

Responsible Staff:	

Uncontaminated Water Line Flushing

BMP Description: Flushing discharges from newly built water lines will be directed to a sediment basin and avoid contact with any disturbed areas.

Responsible Staff:	

Repeat as needed

SECTION 4: SELECTING POST-CONSTRUCTION BMPs

Instructions:

- Describe all post-construction stormwater management measures that will be installed during the construction process to control pollutants in stormwater discharges after construction operations have been completed. Examples of post-construction BMPs include the following:
  - ✓ Biofilters
  - ✓ Detention/retention devices
  - ✓ Earth dikes, drainage swales, and lined ditches
  - ✓ Infiltration basins
  - ✓ Porous pavement
  - ✓ Other proprietary permanent structural BMPs
  - ✓ Outlet protection/velocity dissipation devices
  - ✓ Slope protection
  - ✓ Vegetated strips and/or swales
- Identify any applicable federal, state, local, or tribal requirements for design or installation.
- Describe how low-impact designs or smart growth considerations have been incorporated into the design.
- For any structural BMPs, you should have design specifications and details and refer to them. Attach them as appendices to the SWPPP or within the text of the SWPPP.
- For more information on this topic, see your state's stormwater manual.
- You might also want to consult one of the references listed in Appendix D of the *SWPPP Guide* and EPA's CGP Part 3, Subparts 3.4.E and 3.9.
- Visit the post-construction section of EPA's Menu of BMPs at: www.epa.gov/npes/menuofbmps

BMP Description: Deep Sump Catch Basins	
Installation Schedule:	Utility construction phase.
Maintenance and Inspection:	See O & M Plan, Appendix N, and Section 2.6 SWPPP.
Responsible Staff:	

BMP Description: Stormceptor	
Installation Schedule:	During construction of storm drainage facilities
Maintenance and Inspection:	See O & M Plan, Appendix N.
Responsible Staff:	

BMP Description: Infiltration/Storage Basin near Unit 1	
Installation Schedule:	Phase 1

Maintenance and Inspection:	See O & M Plan, Appendix N.
Responsible Staff:	

BMP Description: Bioretention Cells	
Installation Schedule:	Concurrent with individual building construction.
Maintenance and Inspection:	See O & M Plan, Appendix N.
Responsible Staff:	

BMP Description: Infiltration/Storage Vaults	
Installation Schedule:	Concurrent with individual building construction.
Maintenance and Inspection:	See O & M Plan, Appendix N.
Responsible Staff:	

BMP Description: Vegetated Swales	
Installation Schedule:	Concurrent with upstream tributary work.
Maintenance and Inspection:	See O & M Plan, Appendix N.
Responsible Staff:	

BMP Description: Water Quality Inlet	
Installation Schedule:	Phase 1
Maintenance and Inspection:	See O & M Plan, Appendix N.
Responsible Staff:	

SECTION 5: INSPECTIONS

5.1 Inspections

Instructions:

- Identify the individual(s) responsible for conducting inspections and describe their qualifications. Reference or attach the inspection form that will be used.
- Describe the frequency that inspections will occur at your site including any correlations to storm frequency and intensity.
- Note that inspection details for particular BMPs should be included in Sections 2 and 3.
- You should also document the repairs and maintenance that you undertake as a result of your inspections. These actions can be documented in the corrective action log described in Part 5.3 below.
- For more on this topic, see *SWPPP Guide*, Chapters 6 and 8 and EPA's CGP Part 3, Subparts 3.6.A, 3.10 and 3.11.C.
- Also, see suggested inspection form in Appendix B of the *SWPPP Guide*.

1. ***Inspection Personnel:*** Identify the person(s) who will be responsible for conducting inspections and describe their qualifications:

2. ***Inspection Schedule and Procedures:***

   Describe the inspection schedules and procedures you have developed for your site (include frequency of inspections for each BMP or group of BMPs, indicate when you will inspect, e.g., before/during/and after rain events, spot inspections):

   Describe the general procedures for correcting problems when they are identified. Include responsible staff and time frames for making corrections:

   Attach a copy of the inspection report you will use for your site.
   See Appendix E.

5.2 Delegation of Authority

Instructions:

- Identify the individual(s) or specifically describe the position where the construction site operator has delegated authority for the purposes of signing inspection reports, certifications, or other information.
- Attach a copy of the signed delegation of authority form that will be used.
- For more on this topic, see *SWPPP Guide*, Chapter 7 and Appendix G, Subsection 11 of EPA's CGP.

Duly Authorized Representative(s) or Position(s):

Insert Company or Organization Name:
Insert Name:
Insert Position:
Insert Address:
Insert City, State, Zip Code:
Insert Telephone Number:
Insert Fax/Email:

Attach a copy of the signed delegation of authority form in Appendix K.

5.3 Corrective Action Log

Instructions:

- Create here, or as an attachment, a corrective action log. This log should describe repair, replacement, and maintenance of BMPs undertaken as a result of the inspections and maintenance procedures described above. Actions related to the findings of inspections should reference the specific inspection report.
- This log should describe actions taken, date completed, and note the person that completed the work.

Corrective Action Log:
See Appendix F.

SECTION 6: RECORDKEEPING AND TRAINING

6.1 Recordkeeping

Instructions:

- The following is a list of records you should keep at your project site available for inspectors to review:
- Dates of grading, construction activity, and stabilization (which is covered in Sections 2 and 3)
- A copy of the construction general permit (attach)
- The signed and certified NOI form or permit application form (attach)
- A copy of the letter from EPA or/the state notifying you of their receipt of your complete NOI/application (attach)
- Inspection reports (attach)
- Records relating to endangered species and historic preservation (attach)
- Check your permit for additional details
- For more on this subject, see *SWPPP Guide*, Chapter 6.C and EPA's CGP Part 3, Subparts 3.4.C, 3.8, 3.10.G and 3.12.A.

Records will be retained for a minimum period of at least 3 years after the permit is terminated.

Date(s) when major grading activities occur:

Date(s) when construction activities temporarily or permanently cease on a portion of the site:

Date(s) when an area is either temporarily or permanently stabilized:

6.2 Log of Changes to the SWPPP

Instructions:

- Create a log here, or as an attachment, of changes and updates to the SWPPP. You should include additions of new BMPs, replacement of failed BMPs, significant changes in the activities or their timing on the project, changes in personnel, changes in inspection and maintenance procedures, updates to site maps, and so on.

Log of changes and updates to the SWPPP
See Appendix G.

6.3 Training

Instructions:

- Training your staff and subcontractors is an effective BMP. As with the other steps you take to prevent stormwater problems at your site, you should document the training that you conduct for your staff, for those with specific stormwater responsibilities (e.g. installing, inspecting, and maintaining BMPs), and for subcontractors.
- Include dates, number of attendees, subjects covered, and length of training.
- For more on this subject, see *SWPPP Guide*, Chapter 8.

Individual(s) Responsible for Training:
See Appendix J.
Describe Training Conducted:

- General stormwater and BMP awareness training for staff and subcontractors:

- Detailed training for staff and subcontractors with specific stormwater responsibilities:

SECTION 7: FINAL STABILIZATION

Instructions:

- Describe procedures for final stabilization. If you complete major construction activities on part of your site, you can document your final stabilization efforts for that portion of the site. Many permits will allow you to then discontinue inspection activities in these areas (be sure to check your permit for exact requirements). You can amend or add to this section as areas of your project are finally stabilized.
- Update your site plans to indicate areas that have achieved final stabilization.
- For more on this topic, see *SWPPP Guide*, Chapter 9 and EPA's CGP Part 3, Subparts 3.11 and 3.13.D, and Part 5, Subpart 5.1.

BMP Description: Following final grading of lawn areas, but not more than 14 days after all other site construction activities are completed, permanent seeding shall be accomplished. Accumulated sediments, construction debris, trash and temporary BMP's will be removed and lawfully disposed of.

Seedbed Preparation

a. Loam will be spread over subgrade to a depth of four to six inches to finished grades.

b. The seedbed will be raked free of clods, rocks, woody debris or other unacceptable materials.

c. Apply lime and fertilizer in accordance with manufacturer's recommendations.

d. If necessary, topsoil will be loosened to a depth of 3 to 5 inches by raking, tilling or other appropriate measures.

Seed Selection/Application

a. Lawn areas will be seeded with a commercial mix of Kentucky Bluegrass, Chewings Fescue and Perennial Ryegrasses suited to long term sunlight exposure. Application rates will be in accordance with the manufacturer's recommendations (typically 1 pound per 1,000 square feet).

b. Seed will be uniformly applied by mechanical broadcasting or hydroseeding. If mechanical broadcast seeding is chosen, it will be covered with ¼ inch of topsoil by raking.

Mulching

Salt marsh hay mulch will be applied immediately following seed installation if mechanical broadcast is employed.

Installation Schedule:	Once site construction activities are completed, landscaped areas

	will be permanently stabilized as soon as possible but in no case more than 14 days after construction completion.
Maintenance and Inspection:	Newly seeded areas will be inspected weekly and after storm events until dense vegetation has established. Any failed areas will be reseeded, fertilized and mulched immediately. Following completion of construction, seeded areas will be monitored until final stabilization is achieved.
Responsible Staff:	

BMP Description:	
Installation Schedule:	
Maintenance and Inspection:	
Responsible Staff:	

Repeat as needed

SECTION 8: CERTIFICATION AND NOTIFICATION

Instructions:

- The SWPPP should be signed and certified by the construction operator(s). Attach a copy of the NOI and permit authorization letter received from EPA or the state in Appendix D.
- For more information, see EPA's CGP Part 3, Subpart 3.12.A-D and Appendix G, Section 11.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ Title: _____

Signature: _____ Date: _____

Repeat as needed for multiple construction operators at the site

SWPPP APPENDICES

Attach the following documentation to the SWPPP:

Appendix A – General Location Map

Appendix B – Site Maps

Appendix C – Construction General Permit

Appendix D – NOI and Acknowledgement Letter from EPA/State

Appendix E – Inspection Reports

Appendix F – Corrective Action Log (or in Part 5.3)

Appendix G – SWPPP Amendment Log (or in Part 6.2)

Appendix H – Subcontractor Certifications/Agreements

Appendix I – Grading and Stabilization Activities Log (or in Part 6.1)

Appendix J – Training Log

Appendix K – Delegation of Authority

Appendix L – Additional Information (i.e., Endangered Species and Historic Preservation Documentation) (None relevant)

Appendix M – Construction Sequencing Plan

Appendix N – Operation and Maintenance Plan

APPENDIX A
GENERAL LOCATION MAP

APPENDIX B
SITE MAPS

SEE SITE DEVELOPMENT PERMIT PLAN – THE MEADOWS
13 SHEETS DATED SEPTEMBER 4, 2008

APPENDIX C
CONSTRUCTION GENERAL PERMIT

NPDES General Permit for Storm Water Discharges From Construction Activities

Table of Contents **As modified effective January 21, 2005**

APPENDICES

National Pollutant Discharge Elimination System
General Permit for Discharges from
Large and Small Construction Activities

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 et. seq., (hereafter CWA or the Act), as amended by the Water Quality Act of 1987, P.L. 100-4, operators of large and small construction activities that are described in Subpart 1.3 of this National Pollutant Discharge Elimination System (NPDES) general permit, except for those activities excluded from authorization of discharge in Subpart 1.3.C of this permit are authorized to discharge pollutants to waters of the United States in accordance with the conditions and requirements set forth herein. Permit coverage is required from the "commencement of construction activities" until "final stabilization" as defined in Appendix A.

This permit shall become effective on July 1, 2003 (as modified effective January 21, 2005).

This permit and the authorization to discharge shall expire at midnight, July 1, 2008.

Signed:

Linda M. Murphy, Director, Office of Ecosystem Protection
EPA Region 1

Kevin Bricke, Acting Director, Division of Environmental Planning and Protection
EPA Region 2

Carlos E. O'Neill, P.E., Acting Division Director, Caribbean Environmental Protection Division
EPA Region 2

John M. Capacasa, Director, Water Protection Division
EPA Region 3

Rebecca Harvey, Chief, NPDES Program Branch
EPA Region 5

Miguel I. Flores, Director, Water Quality Protection Division
EPA Region 6

Leo J. Alderman, Director, Water, Wetlands, and Pesticides Division
EPA Region 7

Stephen S. Tuber, Assistant Regional Administrator, Office of Partnerships and Regulatory Assistance
EPA Region 8

Nancy Woo, Acting Director, Water Division
EPA Region 9

Randall F. Smith, Director, Office of Water
EPA Region 10

The signatures are for the permit conditions in Parts 1 through 9 and Appendices A through G and for any additional conditions which apply to facilities located in the corresponding state, Indian country, or other area.

PART 1: COVERAGE UNDER THIS PERMIT

1.1 Introduction

This Construction General Permit (CGP) authorizes storm water discharges from large and small construction activities that result in a total land disturbance of equal to or greater than one acre, where those discharges enter surface waters of the United States or a municipal separate storm sewer system (MS4) leading to surface waters of the United States subject to the conditions set forth in this permit. This permit also authorizes storm water discharges from any other construction activity designated by EPA where EPA makes that designation based on the potential for contribution to an excursion of a water quality standard or for significant contribution of pollutants to waters of the United States. This permit replaces two permits issued in 1998 (63 FR 7858, February 17, 1998 for EPA Regions 1, 2, 3, 7, 8, 9, and 10 and 63 FR 36489, July 6, 1998 for EPA Region 6). Any references to the 1998 CGP in this permit refer to those two permits.

This permit is presented in a reader-friendly, plain language format. This permit uses the terms "you" and "your" to identify the person(s) who owns or operates a "facility" or "activity" as defined in Appendix A and who must comply with the conditions of this permit. This format should allow you, the permittee and operator of a large or small construction activity, to easily locate and understand applicable requirements.

The goal of this permit is to reduce or eliminate storm water pollution from construction activity by requiring that you plan and implement appropriate pollution control practices to protect water quality.

1.2 Permit Area

If your large or small construction activity is located within the areas listed in Appendix B, you may be eligible to obtain coverage under this permit. Permit coverage is actually provided by legally separate and distinctly numbered permits covering each of the areas listed in Appendix B.

1.3 Eligibility

Permit eligibility is limited to discharges from "large" and "small" construction activity as defined in Appendix A or as otherwise designated by EPA. This general permit contains eligibility restrictions, as well as permit conditions and requirements. You may have to take certain actions to be eligible for coverage under this permit. In such cases, you must continue to satisfy those eligibility provisions to maintain permit authorization. If you do not meet the requirements that are a pre-condition to eligibility, then resulting discharges constitute unpermitted discharges. By contrast, if you do not comply with the requirements of the general permit, you may be in violation of the general permit for your otherwise eligible discharges.

A. Allowable Storm Water Discharges

Subject to compliance with the terms and conditions of this permit, you are authorized to discharge pollutants in:

1. Storm water associated with large and small construction activity as defined in Appendix A;
2. Storm water discharges designated by EPA as needing a storm water permit under 40 CFR §122.26(a)(1)(v) or §122.26(b)(15)(ii);
3. Discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided:
   a. The support activity is directly related to the construction site required to have NPDES permit coverage for discharges of storm water associated with construction activity;
   b. The support activity is not a commercial operation serving multiple unrelated construction projects by different operators, and does not operate beyond the completion of the construction activity at the last construction project it supports; and
   c. Appropriate controls and measures are identified in a Storm Water Pollution Prevention Plan (SWPPP) covering the discharges from the support activity areas; and
4. Discharges composed of allowable discharges listed in 1.3.A and 1.3.B commingled with a discharge authorized by a different NPDES permit and/or a discharge that does not require NPDES permit authorization.

B. Allowable Non-Storm Water Discharges

You are authorized for the following non-storm water discharges, provided the non-storm water component of the discharge is in compliance with Subpart 3.5 (Non-Storm Water Discharge Management):

1. Discharges from fire-fighting activities;
2. Fire hydrant flushings;
3. Waters used to wash vehicles where detergents are not used;
4. Water used to control dust in accordance with Subpart 3.4.G;
5. Potable water including uncontaminated water line flushings;
6. Routine external building wash down that does not use detergents;
7. Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
8. Uncontaminated air conditioning or compressor condensate;
9. Uncontaminated ground water or spring water;
10. Foundation or footing drains where flows are not contaminated with process materials such as solvents;
11. Uncontaminated excavation dewatering;
12. Landscape irrigation.

C. Limitations on Coverage

1. This permit does not authorize post-construction discharges that originate from the site after construction activities have been completed and the site has achieved final stabilization, including any temporary support activity. Post-construction storm water discharges from industrial sites may need to be covered by a separate NPDES permit.
2. This permit does not authorize discharges mixed with non-storm water. This exclusion does not apply to discharges identified in Subpart 1.3.B, provided the discharges are in compliance with Subpart 3.5 (Non-Storm Water Discharge Management).
3. This permit does not authorize storm water discharges associated with construction activity that have been covered under an individual permit or required to obtain coverage under an alternative general permit in accordance with Subpart 4.2.
4. This permit does not authorize discharges that EPA, prior to authorization under this permit, determines will cause, have the reasonable potential to cause, or contribute to an excursion above any applicable water quality standard. Where such a determination is made prior to authorization, EPA may notify you that an individual permit application is necessary in accordance with Subpart 4.2. However, EPA may authorize your coverage under this permit after you have included appropriate controls and implementation procedures in your SWPPP designed to bring your discharge into compliance with water quality standards.
5. *Discharging into Receiving Waters With an Approved Total Maximum Daily Load Analysis*
   a. You are not eligible for coverage under this permit for discharges of pollutants of concern to waters for which there is a total maximum daily load (TMDL) established or approved by EPA unless you incorporate into your SWPPP measures or controls that are consistent with the assumptions and requirements of such TMDL. To be eligible for coverage under this general permit, you must incorporate into your SWPPP any conditions applicable to your discharges necessary for consistency with the assumptions and requirements of such TMDL. If a specific wasteload allocation has been established that would apply to your discharge, you must incorporate that allocation into your SWPPP and implement necessary steps to meet that allocation.
   b. In a situation where an EPA-approved or established TMDL has specified a general wasteload allocation applicable to construction storm water discharges, but no specific requirements for construction sites have been identified in the TMDL, you should consult with the State or Federal TMDL authority to confirm that adherence to a SWPPP that meets the requirements of the CGP will be consistent with the approved TMDL. Where an EPA-approved or established TMDL has not

specified a wasteload allocation applicable to construction storm water discharges, but has not specifically excluded these discharges, adherence to a SWPPP that meets the requirements of the CGP will generally be assumed to be consistent with the approved TMDL. If the EPA-approved or established TMDL specifically precludes such discharges, the operator is not eligible for coverage under the CGP.

6. *Endangered and Threatened Species and Critical Habitat Protection*

   a. Coverage under this permit is available only if your storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities, as defined in Appendix A, are not likely to jeopardize the continued existence of any species that are federally-listed as endangered or threatened ("listed") under the Endangered Species Act (ESA) or result in the adverse modification or destruction of habitat that is federally-designated as critical under the ESA ("critical habitat").

   b. You are not eligible to discharge if the storm water discharges, allowable non-storm water discharges, or storm water discharge-related activities would cause a prohibited "take" of federally-listed endangered or threatened species (as defined under section 3 of the ESA and 50 CFR 17.3), unless such takes are authorized under sections 7 or 10 of the ESA.

   c. Determining Eligibility: You must use the process in Appendix C (ESA Review Procedures) to determine eligibility *PRIOR* to submittal of the Notice of Intent (NOI). You must meet one or more of the following six criteria (A-F) for the entire term of coverage under the permit:

   Criterion A. No federally-listed threatened or endangered species or their designated critical habitat are in the project area as defined in Appendix C; or

   Criterion B. Formal consultation with the Fish and Wildlife Service and/or the National Marine Fisheries Service under section 7 of the ESA has been concluded and that consultation:

      i. Addressed the effects of the project's storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat, and
      ii. The consultation resulted in either:

         a. Biological opinion finding no jeopardy to federally-listed species or destruction/adverse modification of federally-designated critical habitat, or

         b. written concurrence from the Service(s) with a finding that the storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities are not likely to adversely affect federally-listed species or federally-designated critical habitat; or

   Criterion C. Informal consultation with the Fish and Wildlife Service and/or the National Marine Fisheries Service under section 7 of the ESA has been concluded and that consultation:

      i. Addressed the effects of the project's storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat, and
      ii. The consultation resulted in either:

         a. Biological opinion finding no jeopardy to federally-listed species or destruction/adverse modification of federally-designated critical habitat, or

         b. written concurrence from the Service(s) with a finding that the storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities are not likely to adversely affect federally-listed species or federally-designated critical habitat; or

   Criterion D. The construction activities are authorized through the issuance of a permit under section 10 of the ESA, and that authorization addresses the effects of the storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities on federally-listed species and federally-designated critical habitat; or

   Criterion E. Storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities are not likely to adversely affect any federally-listed

threatened or endangered species or result in the destruction or adverse modification of federally-designated critical habitat; or

Criterion F. The project's storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities were already addressed in another operator's valid certification of eligibility under Criteria A-E which included your construction activities and there is no reason to believe that federally-listed species or federally-designated critical habitat not considered in the prior certification may be present or located in the project area. By certifying eligibility under this criterion, you agree to comply with any measures or controls upon which the other operator's certification was based.

You must comply with any applicable terms, conditions, or other requirements developed in the process of meeting the eligibility requirements of the criteria in this section to remain eligible for coverage under this permit. Such terms and conditions must be documented and incorporated into your SWPPP.

7. Historic Properties

[Reserved]

You are reminded that you must comply with applicable state, tribal and local laws concerning the protection of historic properties and places.

1.4 Waivers for Certain Small Construction Activities

Three scenarios exist under which small construction activities (see definition in Appendix A) may be waived from the NPDES permitting requirements detailed in this general permit. These exemptions are predicated on certain criteria being met and proper notification procedures being followed. Details of the waiver options and procedures for requesting a waiver are provided in Appendix D.

PART 2: AUTHORIZATION FOR DISCHARGES OF STORM WATER FROM CONSTRUCTION ACTIVITY

To obtain coverage under this general permit, you, the operator, must prepare and submit a complete and accurate Notice of Intent (NOI), as described in this Part. Discharges are not authorized if your NOI is incomplete or inaccurate or if you were never eligible for permit coverage.

2.1 Authorization to Discharge Date

This permit is effective as of the publication date in the Federal Register and is effective for five years, expiring at midnight on the anniversary of publication in the fifth year.

A. If you submit an NOI during the first 90 days after the issuance date of this permit you are authorized to discharge storm water from construction activities under the terms and conditions of this permit seven (7) calendar days after submittal to EPA of a complete and accurate NOI (i.e., 7 days from date of postmark), except as noted in Subpart 2.1.C.

B. If you submit an NOI after the first 90 days of this permit and prior to the expiration date of this permit, you are authorized to discharge storm water from construction activities under the terms and conditions of this permit seven (7) calendar days after acknowledgment of receipt of your complete NOI is posted on EPA's NPDES website ***http://www.epa.gov/npdes/stormwater/cgp***, except as noted in Subpart 2.1.C.

C. EPA may delay your authorization based on eligibility considerations of Subpart 1.3 (e.g., ESA concerns). In these instances, you are not authorized for coverage under this permit until you receive notice from EPA of your eligibility.

2.2 Notice of Intent Contents

A. You must use the NOI form provided in Appendix E (or a photocopy thereof) and available at **www.epa.gov/npdes/stormwater/cgp**. If EPA makes other NOI forms available (either directly, by public notice, or by making information available on the Internet), you may take advantage of any of those options to satisfy the NOI use requirements of this Subpart.

B. You must provide the following information on the NOI form:

1. The applicable permit number for which you are requesting coverage (See Appendix B);

2. Operator name, address, telephone number, and Employer Identification Number (EIN) as established by the U.S. Internal Revenue Service;
3. Project/Site name, address, county or similar governmental subdivision, and latitude/longitude of your construction project or site;
4. Whether your site is located in Indian country and if so, the name of the Reservation, if applicable;
5. Whether the SWPPP has been prepared in advance of filing of this NOI and the location where the applicable SWPPP may be viewed;
6. Name of the water(s) of the U.S. into which your site discharges;
7. Indication whether your discharge is consistent with the assumptions and requirements of applicable EPA approved or established TMDLs;
8. Estimated dates of commencement of construction activity and final stabilization (i.e., project start and completion dates);
9. Total acreage (to the nearest quarter acre) to be disturbed for which you are requesting permit coverage;
10. Whether any federally-listed threatened or endangered species, or federally-designated critical habitat are in your project area to be covered by this permit, and the basis for certifying eligibility for permit coverage based on the instructions in Appendix C;
11. A certification statement, signed and dated by an authorized representative as defined in Appendix G, Section 11, and the name and title of that authorized representative.

2.3 Submission Deadlines

A. *New Projects:* To obtain coverage under this permit, you must submit a complete and accurate NOI and be authorized consistent with Subpart 2.1 prior to your commencement of construction activities.

B. *Permitted Ongoing Projects (only applicable for first 90 days after this permit is issued):* If you previously received authorization to discharge for your project under the 1998 CGP and you wish to continue coverage under this permit:

1. Except as noted in 2.3.B.2, you must:
    1. Submit an NOI within 90 days of the issuance date of this permit, and
    2. Until you are authorized under this permit consistent with Subpart 2.1, comply with the terms and conditions of the 1998 CGP under which you were previously authorized.
2. If you meet the termination of coverage requirements in accordance with Subpart 5.1 within 90 days of the issuance date of this permit (e.g., construction will be finished and final stabilization achieved) you must:
    1. Submit an NOT consistent with the 2003 CGP using the NOT form provided in Appendix F, and
    2. Until coverage is no longer required, comply with the terms and conditions of the 1998 CGP under which you were previously authorized.

C. *Unpermitted Ongoing Projects (only applicable for first 90 days after this permit is issued):* If you previously did not receive authorization to discharge for your project under the 1998 CGP and you wish to obtain coverage under this permit:

1. Except as noted in 2.3.C.2, you must:
    1. Submit an NOI within 90 days of the issuance date of this permit, and
    2. Until you are authorized under this permit consistent with Subpart 2.1, comply with an interim Storm Water Pollution Prevention Plan (SWPPP) consistent with the 1998 CGP.
2. If you meet the termination of coverage requirements in accordance with Subpart 5.1 within 90 days of the issuance date of this permit (e.g., construction will be finished and final stabilization achieved) you must comply with an interim Storm Water Pollution Prevention Plan (SWPPP) consistent with the 1998 CGP until permit coverage is no longer required.

D. *Late Notifications:* Operators are not prohibited from submitting NOIs after initiating clearing, grading, excavation activities, or other construction activities. When a late NOI is submitted, authorization for discharges occurs consistent with Subpart 2.1. The Agency reserves the right to take enforcement action for any unpermitted discharges that occur between the commencement of construction and discharge authorization.

2.4 Where to Submit

A. Except as noted in Subpart 2.3.B, you must send your complete and accurate NOI to EPA at one of the following addresses:

For Regular U.S. Mail Delivery:
EPA Storm Water Notice Processing Center
Mail Code 4203M
U.S. EPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460

For Overnight/Express Mail Delivery:
EPA Storm Water Notice Processing Center
Room 7420
U.S. EPA
1201 Constitution Avenue, NW
Washington, DC 20004

B. In lieu of Subpart 2.4.A, when available, you may submit your NOI using EPA's electronic NOI system (i.e., eNOI) as detailed at www.epa.gov/npdes/stormwater/cgp.

PART 3: STORM WATER POLLUTION PREVENTION PLANS (SWPPPS)

3.1 Storm Water Pollution Prevention Plan Framework

A. A SWPPP must be prepared prior to submission of an NOI as required in Part 2. At least one SWPPP must be developed for each construction project covered by this permit and such SWPPP must be prepared in accordance with good engineering practices.

B. The SWPPP must:

1. Identify all potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges from the construction site;
2. Describe practices to be used to reduce pollutants in storm water discharges from the construction site; and
3. Assure compliance with the terms and conditions of this permit.

C. Once a definable area has been finally stabilized, you may mark this on your SWPPP and no further SWPPP or inspection requirements apply to that portion of the site (e.g., earth-disturbing activities around one of three buildings in a complex are done and the area is finally stabilized, one mile of a roadway or pipeline project is done and finally stabilized, etc).

D. You must implement the SWPPP as written from commencement of construction activity until final stabilization is complete.

3.2 Requirements for Different Types of Operators

You may meet one or both of the operational control components in the definition of operator found in Appendix A. Subpart 3.2.C applies to all permittees having control over only a portion of a construction site.

A. If you have operational control over construction plans and specifications, you must ensure that:

1. The project specifications meet the minimum requirements of this Subpart and all other applicable permit conditions;
2. The SWPPP indicates the areas of the project where the operator has operational control over project specifications, including the ability to make modifications in specifications;
3. All other permittees implementing portions of the SWPPP (or their own SWPPP) who may be impacted by a change to the construction plan are notified of such changes in a timely manner; and
4. The SWPPP indicates the name of the party(ies) with day-to-day operational control of those activities necessary to ensure compliance with the SWPPP or other permit conditions.

B. If you have operational control over day-to-day activities, you must ensure that:

1. The SWPPP meets the minimum requirements of this Subpart and identifies the parties responsible for implementation of control measures identified in the plan;
2. The SWPPP indicates areas of the project where you have operational control over day-to-day activities;
3. The SWPPP indicates the name of the party(ies) with operational control over project specifications (including the ability to make modifications in specifications).

C. If you have operational control over only a portion of a larger project (e.g., one of four homebuilders in a subdivision), you are responsible for compliance with all applicable terms and conditions of this permit as it relates to your activities on your portion of the construction site, including protection of endangered species, critical habitat, and historic properties, and implementation of best management practices (BMPs) and other controls required by the SWPPP. You must ensure either directly or through coordination with other permittees, that your activities do not render another party's pollution control ineffective. You must either implement your portion of a common SWPPP or develop and implement your own SWPPP.

For more effective coordination of BMPs and opportunities for cost sharing, a cooperative effort by the different operators at a site to prepare and participate in a comprehensive SWPPP is encouraged. Individual operators at a site may, but are not required to, develop separate SWPPPs that cover only their portion of the project provided reference is made to other operators at the site. In instances where there is more than one SWPPP for a site, cooperation between the permittees is encouraged to ensure the storm water discharge controls and other measures are consistent with one another (e.g., provisions to protect listed species and critical habitat).

3.3 Pollution Prevention Plan Contents: Site and Activity Description

A. The SWPPP must identify all operators for the project site, and the areas of the site over which each operator has control.

B. The SWPPP must describe the nature of the construction activity, including:

1. The function of the project (e.g., low density residential, shopping mall, highway, etc.);
2. The intended sequence and timing of activities that disturb soils at the site;
3. Estimates of the total area expected to be disturbed by excavation, grading, or other construction activities, including dedicated off-site borrow and fill areas; and
4. A general location map (e.g., USGS quadrangle map, a portion of a city or county map, or other map) with enough detail to identify the location of the construction site and waters of the United States within one mile of the site.

C. The SWPPP must contain a legible site map, showing the entire site, identifying:

1. Direction(s) of storm water flow and approximate slopes anticipated after major grading activities;
2. Areas of soil disturbance and areas that will not be disturbed;
3. Locations of major structural and nonstructural BMPs identified in the SWPPP;
4. Locations where stabilization practices are expected to occur;
5. Locations of off-site material, waste, borrow or equipment storage areas;
6. Locations of all waters of the United States (including wetlands);
7. Locations where storm water discharges to a surface water; and
8. Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

D. The SWPPP must describe and identify the location and description of any storm water discharge associated with industrial activity other than construction at the site. This includes storm water discharges from dedicated asphalt plants and dedicated concrete plants, that are covered by this permit.

3.4 Pollution Prevention Plan Contents: Controls to Reduce Pollutants

A. The SWPPP must include a description of all pollution control measures (i.e., BMPs) that will be implemented as part of the construction activity to control pollutants in storm water discharges. For each major activity identified in the project description the SWPPP must clearly describe appropriate control measures, the general sequence during the construction process in which the measures will be implemented, and which operator is responsible for the control measure's implementation.

B. The SWPPP must include a description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented. Site plans should ensure that existing vegetation is preserved where possible and that disturbed portions of the site are stabilized. Use of impervious surfaces for stabilization should be avoided.

C. The following records must be maintained as part of the SWPPP:

1. Dates when major grading activities occur;
2. Dates when construction activities temporarily or permanently cease on a portion of the site; and
3. Dates when stabilization measures are initiated.

D. The SWPPP must include a description of structural practices to divert flows from exposed soils, retain/detain flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Placement of structural practices in floodplains must be avoided to the degree practicable.

E. The SWPPP must include a description of all post-construction storm water management measures that will be installed during the construction process to control pollutants in storm water discharges after construction operations have been completed. Structural measures should be placed on upland soils to the degree practicable. Such measures must be designed and installed in compliance with applicable federal, local, state or tribal requirements.

F. The SWPPP must describe measures to prevent the discharge of solid materials, including building materials, to waters of the United States, except as authorized by a permit issued under section 404 of the CWA.

G. The SWPPP must describe measures to minimize, to the extent practicable, off-site vehicle tracking of sediments onto paved surfaces and the generation of dust.

H. The SWPPP must include a description of construction and waste materials expected to be stored on-site with updates as appropriate. The SWPPP must also include a description of controls, including storage practices, to minimize exposure of the materials to storm water, and spill prevention and response practices.

I. The SWPPP must include a description of pollutant sources from areas other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those sites to minimize pollutant discharges.

3.5 Non-Storm Water Discharge Management

The SWPPP must identify all allowable sources of non-storm water discharges listed in Subpart 1.3.B of this permit, except for flows from fire fighting activities, that are combined with storm water discharges associated with construction activity at the site. Non-storm water discharges should be eliminated or reduced to the extent feasible. The SWPPP must identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

3.6 Maintenance of Controls

A. All erosion and sediment control measures and other protective measures identified in the SWPPP must be maintained in effective operating condition. If site inspections required by Subpart 3.10 identify BMPs that are not operating effectively, maintenance must be performed as soon as possible and before the next storm event whenever practicable to maintain the continued effectiveness of storm water controls.

B. If existing BMPs need to be modified or if additional BMPs are necessary for any reason, implementation must be completed before the next storm event whenever practicable. If implementation before the next storm event is impracticable, the situation must be documented in the SWPPP and alternative BMPs must be implemented as soon as possible.

C. Sediment from sediment traps or sedimentation ponds must be removed when design capacity has been reduced by 50 percent.

3.7 Documentation of Permit Eligibility Related to Endangered Species

The SWPPP must include documentation supporting a determination of permit eligibility with regard to Endangered Species, including:

A. Information on whether federally-listed endangered or threatened species, or federally-designated critical habitat may be in the project area;

B. Whether such species or critical habitat may be adversely affected by storm water discharges or storm water discharge-related activities from the project;

C. Results of the Appendix C listed species and critical habitat screening determinations;

D. Confirmation of delivery of NOI to EPA or to EPA's electronic NOI system. This may include an overnight, express or registered mail receipt acknowledgment; or electronic acknowledgment from EPA's electronic NOI system.

E. Any correspondence for any stage of project planning between the U.S. Fish and Wildlife Service (FWS), EPA, the U.S. National Marine Fisheries Service (NMFS), or others and you regarding listed species and critical habitat, including any notification that delays your authorization to discharge under this permit;

F. A description of measures necessary to protect federally-listed endangered or threatened species, or federally-designated critical habitat. The permittee must describe and implement such measures to maintain eligibility for coverage under this permit.

3.8 Copy of Permit Requirements

Copies of this permit and of the signed and certified NOI form that was submitted to EPA must be included in the SWPPP. Also, upon receipt, a copy of the letter from the EPA Storm Water Notice Processing Center notifying you of their receipt of your administratively complete NOI must also be included as a component of the SWPPP.

3.9 Applicable State, Tribal, or Local Programs

The SWPPP must be consistent with all applicable federal, state, tribal, or local requirements for soil and erosion control and storm water management, including updates to the SWPPP as necessary to reflect any revisions to applicable federal, state, tribal, or local requirements for soil and erosion control.

3.10 Inspections

A. Inspections must be conducted in accordance with one of the two schedules listed below. You must specify in your SWPPP which schedule you will be following.

1. At least once every 7 calendar days, OR
2. At least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater.

B Inspection frequency may be reduced to at least once every month if:

1. The entire site is temporarily stabilized,
2. Runoff is unlikely due to winter conditions (e.g., site is covered with snow, ice, or the ground is frozen), or
3. Construction is occurring during seasonal arid periods in arid areas and semi-arid areas.

C. A waiver of the inspection requirements is available until one month before thawing conditions are expected to result in a discharge if all of the following requirements are met:

1. The project is located in an area where frozen conditions are anticipated to continue for extended periods of time (i.e., more than one month);
2. Land disturbance activities have been suspended; and
3. The beginning and ending dates of the waiver period are documented in the SWPPP.

D. Inspections must be conducted by qualified personnel (provided by the operator or cooperatively by multiple operators). "Qualified personnel" means a person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact

storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity.

E. Inspections must include all areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation. Inspectors must look for evidence of, or the potential for, pollutants entering the storm water conveyance system. Sedimentation and erosion control measures identified in the SWPPP must be observed to ensure proper operation. Discharge locations must be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to waters of the United States, where accessible. Where discharge locations are inaccessible, nearby downstream locations must be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site must be inspected for evidence of off-site sediment tracking.

F. Utility line installation, pipeline construction, and other examples of long, narrow, linear construction activities may limit the access of inspection personnel to the areas described in Subpart 3.10.E above. Inspection of these areas could require that vehicles compromise temporarily or even permanently stabilized areas, cause additional disturbance of soils, and increase the potential for erosion. In these circumstances, controls must be inspected on the same frequencies as other construction projects, but representative inspections may be performed. For representative inspections, personnel must inspect controls along the construction site for 0.25 mile above and below each access point where a roadway, undisturbed right-of-way, or other similar feature intersects the construction site and allows access to the areas described above. The conditions of the controls along each inspected 0.25 mile segment may be considered as representative of the condition of controls along that reach extending from the end of the 0.25 mile segment to either the end of the next 0.25 mile inspected segment, or to the end of the project, whichever occurs first.

G. For each inspection required above, you must complete an inspection report. At a minimum, the inspection report must include:

1. The inspection date;
2. Names, titles, and qualifications of personnel making the inspection;
3. Weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;
4. Weather information and a description of any discharges occurring at the time of the inspection;
5. Location(s) of discharges of sediment or other pollutants from the site;
6. Location(s) of BMPs that need to be maintained;
7. Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
8. Location(s) where additional BMPs are needed that did not exist at the time of inspection; and
9. Corrective action required including any changes to the SWPPP necessary and implementation dates.

A record of each inspection and of any actions taken in accordance with this Part must be retained as part of the SWPPP for at least three years from the date that permit coverage expires or is terminated. The inspection reports must identify any incidents of non-compliance with the permit conditions. Where a report does not identify any incidents of non-compliance, the report must contain a certification that the construction project or site is in compliance with the SWPPP and this permit. The report must be signed in accordance with Appendix G, Section 11 of this permit.

3.11 Maintaining an Updated Plan

A. The SWPPP, including the site map, must be amended whenever there is a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to the waters of the United States that has not been previously addressed in the SWPPP.

B. The SWPPP must be amended if during inspections or investigations by site staff, or by local, state, tribal or federal officials, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in storm water discharges from the construction site.

C. Based on the results of an inspection, the SWPPP must be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP must be completed within

seven (7) calendar days following the inspection. Implementation of these additional or modified BMPs must be accomplished as described in Subpart 3.6.B.

3.12 Signature, Plan Review and Making Plans Available

A. A copy of the SWPPP (including a copy of the permit), NOI, and acknowledgement letter from EPA must be retained at the construction site (or other location easily accessible during normal business hours to EPA, a state, tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a municipal separate storm sewer receiving discharges from the site; and representatives of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service) from the date of commencement of construction activities to the date of final stabilization. If you have day-to-day operational control over SWPPP implementation, you must have a copy of the SWPPP available at a central location on-site for the use of all those identified as having responsibilities under the SWPPP whenever they are on the construction site. If an on-site location is unavailable to store the SWPPP when no personnel are present, notice of the plan's location must be posted near the main entrance at the construction site.

B. A sign or other notice must be posted conspicuously near the main entrance of the construction site. If displaying near the main entrance is infeasible, the notice can be posted in a local public building such as the town hall or public library. The sign or other notice must contain the following information:

   1. A copy of the completed Notice of Intent as submitted to the EPA Storm Water Notice Processing Center; and

   2. If the location of the SWPPP or the name and telephone number of the contact person for scheduling SWPPP viewing times has changed (i.e., is different than that submitted to EPA in the NOI), the current location of the SWPPP and name and telephone number of a contact person for scheduling viewing times.

   For linear projects, the sign or other notice must be posted at a publicly accessible location near the active part of the construction project (e.g., where a pipeline project crosses a public road).

C. SWPPPs must be made available upon request by EPA; a state, tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a municipal separate storm sewer receiving discharges from the site; and representatives of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service to the requestor. The copy of the SWPPP that is required to be kept on-site or locally available must be made available, in its entirety, to the EPA staff for review and copying at the time of an on-site inspection.

D. All SWPPPs must be signed and certified in accordance with Appendix G, Section 11.

3.13 Management Practices

A. All control measures must be properly selected, installed, and maintained in accordance with any relevant manufacturer specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately, or incorrectly, the operator must replace or modify the control for site situations as soon as practicable.

B. If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize off-site impacts.

C. Litter, construction debris, and construction chemicals that could be exposed to storm water must be prevented from becoming a pollutant source in storm water discharges.

D. Except as provided below, stabilization measures must be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

   1. Where stabilization by the 14th day is precluded by snow cover or frozen ground conditions, stabilization measures must be initiated as soon as practicable.

   2. Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 14 days, temporary stabilization measures do not have to be initiated on that portion of the site.

3. In arid, semiarid, and drought-stricken areas where initiating perennial vegetative stabilization measures is not possible within 14 days after construction activity has temporarily or permanently ceased, final vegetative stabilization measures must be initiated as soon as practicable.

E. A combination of sediment and erosion control measures are required to achieve maximum pollutant removal.

1. Sediment Basins: For common drainage locations that serve an area with 10 or more acres disturbed at one time, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from the drainage area from a 2-year, 24-hour storm, or equivalent control measures, must be provided where attainable until final stabilization of the site. Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, must be provided where attainable until final stabilization of the site. When computing the number of acres draining into a common location, it is not necessary to include flows from offsite areas and flows from on-site areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin. In determining whether installing a sediment basin is attainable, the operator may consider factors such as site soils, slope, available area on-site, etc. In any event, the operator must consider public safety, especially as it relates to children, as a design factor for the sediment basin, and alternative sediment controls must be used where site limitations would preclude a safe design.

2. For drainage locations which serve 10 or more disturbed acres at one time and where a temporary sediment basin or equivalent controls is not attainable, smaller sediment basins and/or sediment traps should be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions).

3. For drainage locations serving less than 10 acres, smaller sediment basins and/or sediment traps should be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions) of the construction area unless a sediment basin providing storage for a calculated volume of runoff from a 2-year, 24-hour storm or 3,600 cubic feet of storage per acre drained is provided.

F. Velocity dissipation devices must be placed at discharge locations and along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., no significant changes in the hydrological regime of the receiving water).

3.14 Documentation of Permit Eligibility Related to Total Maximum Daily Loads

The SWPPP must include documentation supporting a determination of permit eligibility with regard to waters that have an EPA-established or approved TMDL, including:

A. Identification of whether your discharge is identified, either specifically or generally, in an EPA-established or approved TMDL and any associated allocations, requirements, and assumptions identified for your discharge;

B. Summaries of consultation with State or Federal TMDL authorities on consistency of SWPPP conditions with the approved TMDL, and

C. Measures taken by you to ensure that your discharge of pollutants from the site is consistent with the assumptions and requirements of the EPA-established or approved TMDL, including any specific wasteload allocation that has been established that would apply to your discharge.

See section 1.3.C.5 for further information on determining permit eligibility related to TMDLs.

PART 4: SPECIAL CONDITIONS, MANAGEMENT PRACTICES AND OTHER NON-NUMERIC LIMITATIONS

4.1 Continuation of the Expired General Permit

If this permit is not reissued or replaced prior to the expiration date, it will be administratively continued in accordance with the Administrative Procedure Act and remain in force and effect. If you were granted permit coverage prior to the expiration date, you will automatically remain covered by the continued permit until the earliest of:

A. Reissuance or replacement of this permit, at which time you must comply with the conditions of the new permit to maintain authorization to discharge; or

B. Your submittal of a Notice of Termination; or

C. Issuance of an individual permit for the project's discharges; or

D. A formal permit decision by EPA to not reissue this general permit, at which time you must seek coverage under an alternative general permit or an individual permit.

4.2 Requiring an Individual Permit or an Alternative General Permit

A. EPA may require you to apply for and/or obtain either an individual NPDES permit or an alternative NPDES general permit. Any interested person may petition EPA to take action under this paragraph. If EPA requires you to apply for an individual NPDES permit, EPA will notify you in writing that a permit application is required. This notification will include a brief statement of the reasons for this decision and an application form. In addition, if you are an existing permittee covered under this permit, the notice will set a deadline to file the application, and will include a statement that on the effective date of issuance or denial of the individual NPDES permit or the alternative general permit as it applies to you, coverage under this general permit will automatically terminate. Applications must be submitted to EPA at the applicable EPA Regional offices listed in Appendix B of this permit. EPA may grant additional time to submit the application upon your request. If you are covered under this permit and you fail to submit in a timely manner an individual NPDES permit application as required by EPA, then the applicability of this permit to you is automatically terminated at the end of the day specified by EPA as the deadline for application submittal.

B. You may request to be excluded from the coverage of this general permit by applying for an individual permit. In such a case, you must submit an individual application in accordance with the requirements of 40 CFR §122.26(c)(1)(ii), with reasons supporting the request, to EPA at the applicable EPA Regional office listed in Appendix B of this permit. The request may be granted by issuance of an individual permit or an alternative general permit if your reasons are adequate to support the request.

C. When an individual NPDES permit is issued to you, who are otherwise subject to this permit, or you are authorized to discharge under an alternative NPDES general permit, the applicability of this permit to you is automatically terminated on the effective date of the individual permit or the date of authorization of coverage under the alternative general permit, whichever the case may be. If you, who are otherwise subject to this permit, are denied an individual NPDES permit or an alternative NPDES general permit, the applicability of this permit to you is automatically terminated on the date of such denial, unless otherwise specified by EPA.

4.3 Releases in Excess of Reportable Quantities

The discharge of hazardous substances or oil in storm water discharges from the construction site must be prevented or minimized in accordance with the SWPPP. This permit does not relieve you of the federal reporting requirements of 40 CFR Part 110, 40 CFR Part 117 and 40 CFR Part 302 relating to spills or other releases of oils or hazardous substances.

Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a 24-hour period:

- you must provide notice to the National Response Center (NRC) (800–424–8802; in the Washington, DC, metropolitan area call 202–426–2675) in accordance with the requirements of 40 CFR Part 110, 40 CFR Part 117 and 40 CFR Part 302 as soon as site staff have knowledge of the discharge; and
- you must modify the SWPPP as required under Subpart 3.11 within 7 calendar days of knowledge of the release to: provide a description of the release, the circumstances leading to the release, and the date of the release. Plans must identify measures to prevent the reoccurrence of such releases and to respond to such releases.

4.4 Spills

This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill.

4.5 Attainment of Water Quality Standards After Authorization

A. You must select, install, implement and maintain BMPs at your construction site that minimize pollutants in the discharge as necessary to meet applicable water quality standards. In general, except in situations explained in Subpart 4.5.B below, your SWPPP developed, implemented, and updated consistent with Part 3.0 is considered as stringent as necessary to ensure that your discharges do not cause or contribute to an excursion above any applicable water quality standard.

B. At any time after authorization, EPA may determine that your storm water discharges may cause, have reasonable potential to cause, or contribute to an excursion above any applicable water quality standard. If such a determination is made, EPA will require you to:

   i. Develop a supplemental BMP action plan describing SWPPP modifications in accordance with Subpart 3.11 to address adequately the identified water quality concerns;

   ii. Submit valid and verifiable data and information that are representative of ambient conditions and indicate that the receiving water is attaining water quality standards; or

   iii. Cease discharges of pollutants from construction activity and submit an individual permit application according to Subpart 4.2.

All written responses required under this part must include a signed certification consistent with Appendix G, Section 11.

PART 5: TERMINATION OF COVERAGE

5.1 Requirements

You may only submit a Notice of Termination (NOT) after one or more of the following conditions have been met:

A. Final stabilization has been achieved on all portions of the site for which you are responsible;

B. Another operator has assumed control according to Appendix G, Section 11.C over all areas of the site that have not been finally stabilized;

C. Coverage under an individual or alternative general NPDES permit has been obtained; or

D. For residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner.

The NOT must be submitted within 30 days of one of the above conditions being met. Authorization to discharge terminates at midnight of the day the NOT is signed.

5.2 Submitting a Notice of Termination

It is your responsibility to submit a complete and accurate Notice of Termination (NOT), using the form provided in Appendix F (or a photocopy thereof) available at www.epa.gov/npdes/stormwater/cgp. If EPA notifies dischargers (either directly, by public notice, or by making information available on the Internet) of other NOT form options (e.g., electronic submission), you may take advantage of those options to satisfy the requirements of Part 5.

A. The Notice of Termination must include the following information:

1. The NPDES permit tracking number for the storm water discharge;
2. The basis for submission of the NOT, including: final stabilization has been achieved on all portions of the site for which the permittee is responsible; another operator/permittee has assumed control over all areas of the site that have not been finally stabilized; coverage under an alternative NPDES permit has been obtained; or, for residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner;
3. You, the operator's name, address, telephone number and your organization's Employer Identification Number (EIN) as established by the U.S. Internal Revenue Service;
4. The name of the project and address (or a description of location if no street address is available) of the construction site for which the notification is submitted; and
5. A certification statement, signed and dated by an authorized representative as defined in Appendix G, Section 11 and the name and title of that authorized representative.

APPENDIX D
NOI AND ACKNOWLEDGEMENT FROM EPA/STATE

APPENDIX E
INSPECTION FORMS

APPENDIX E

Stormwater Construction Site Inspection Report

General Information			
Project Name The Meadows			
NPDES Tracking No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications	Insert qualifications or add reference to the SWPPP. (See Section 5 of the SWPPP Template)		
Describe present phase of construction			
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs.at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
1	Deep Sump Basins	❑Yes ❑No	❑Yes ❑No	
2	Stormceptor	❑Yes ❑No	❑Yes ❑No	
3	Sediment Traps	❑Yes ❑No	❑Yes ❑No	
4	Basin Unit 1	❑Yes ❑No	❑Yes ❑No	
5	Bioretention Cells	❑Yes ❑No	❑Yes ❑No	
6	Roof Basins	❑Yes ❑No	❑Yes ❑No	
7		❑Yes ❑No	❑Yes ❑No	
8		❑Yes ❑No	❑Yes ❑No	
9		❑Yes ❑No	❑Yes ❑No	
10		❑Yes ❑No	❑Yes ❑No	
11		❑Yes ❑No	❑Yes ❑No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
12		❑Yes ❑No	❑Yes ❑No	
13		❑Yes ❑No	❑Yes ❑No	
14		❑Yes ❑No	❑Yes ❑No	
15		❑Yes ❑No	❑Yes ❑No	
16		❑Yes ❑No	❑Yes ❑No	
17		❑Yes ❑No	❑Yes ❑No	
18		❑Yes ❑No	❑Yes ❑No	
19		❑Yes ❑No	❑Yes ❑No	
20		❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed and maintained?	❑Yes ❑No	❑Yes ❑No	
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
6	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
8	Are washout facilities (e.g., paint, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
10	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other) Driveway sweeping and dust control	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature: _____ **Date:** _____

Appendix F – *Sample* Corrective Action Log

Project Name:
SWPPP Contact:

Inspection Date	Inspector Name(s)	Description of BMP Deficiency	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/Responsible person

Appendix G – *Sample* SWPPP Amendment Log

Project Name:
SWPPP Contact:

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

Appendix H – *Sample* Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the BMPs and practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

_____

Signature: _____

Title: _____

Date: _____

Appendix I – *Sample* Grading and Stabilization Activities Log

Project Name:
SWPPP Contact:

Date Grading Activity Initiated	Description of Grading Activity	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures are Initiated	Description of Stabilization Measure and Location

Appendix J – *Sample* SWPPP Training Log

Stormwater Pollution Prevention Training Log

Project Name:

Project Location:

Instructor's Name(s):

Instructor's Title(s):

Course Location: _____ Date: _____

Course Length (hours): _____

Stormwater Training Topic: *(check as appropriate)*

- ❑ **Erosion Control BMPs**
- ❑ **Emergency Procedures**
- ❑ **Sediment Control BMPs**
- ❑ **Good Housekeeping BMPs**
- ❑ **Non-Stormwater BMPs**

Specific Training Objective:_____

_____

Attendee Roster: *(attach additional pages as necessary)*

No.	Name of Attendee	Company
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Appendix K – *Sample* Delegation of Authority Form

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)
_____ (company)
_____ (address)
_____ (city, state, zip)
_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix G, Subsection 11.A of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix G, Subsection 11.B (1-3).

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____

Company: _____

Title: _____

Signature: _____

Date: _____

APPENDIX L
ADDITIONAL INFORMATION

APPENDIX M
CONSTRUCTION SEQUENCING PLAN

Construction Sequencing Plan
New Meadows • Topsfield, MA.

PHASE I

A. Site Preparation

1. Install silt barriers between any proposed work areas and downhill slopes;

2. Clear and grub wooded area(s) and existing trees to be removed within the work area;

3. Remove existing paving within the work area and process for re-use as recycled base for new paving;

4. Establish project staging area(s);

5. Demolish existing dwellings.

B. Driveway and Utility Construction

1. Construct water main from Route 1 to new golf course parking lot entrance, test, flush and chlorinate, connect new service to clubhouse;

2. Construct utility systems in driveway through end of cul-de-sac;

3. Construct stormwater basin adjacent to Unit 1;

4. Construct stormwater serving catch basins at Station 4 + 90;

5. Construct septic system components as follows:

   a. Dosing Chamber

   b. Valve Manhole

   c. Leach Beds A-1 and B-1

6. As an ongoing activity, construct temporary stormwater and erosion control best management practices in accordance with the NPDES SWPPP and specific demands of the project.

C. Golf Course Improvements

1. Construct new 40 space parking lot adjacent to Wildes Road (designated portions of existing paving shown on construction phasing plan will remain until Phase II);

2. Construct stormwater basin, catch basin, drain manhole Stormceptor and associated piping.

D. Building Construction

1. Construct foundations and commence building construction for Units 1-8 (2 buildings);

2. Construct ancillary septic tanks, roof runoff basins, unit driveways (through binder course).

PHASE II

A. Septic System and Site Preparation

1. Construct Leach Beds A-2 and B-2;

2. Construct additional silt barriers as needed.

B. Golf Course Improvements

1. Construct remainder of new parking facilities and associated stormwater management;

2. Construct new practice green;

3. Regrading and new pedestrian access ways to clubhouse.

C. Building Construction

1. Construct foundations and commence building construction for Units 9-12 and 21-24 (2 buildings);

2. Construct ancillary septic tanks, roof runoff basins, unit driveways (through binder course);

3. Final landscaping and rain garden for Units 1-8.

D. Other

1. Fill and abandon existing well near Unit 12;

2. Maintain such stormwater best management practices as are in service (ongoing).

PHASE III

A. Site Preparation

1. Demolish existing golf course maintenance building;

2. Install additional silt barriers as necessary;

3. Clear and grub area of Units 13-20 (2 buildings).

B. Driveway and Utility Construction

1. Construct retaining wall adjacent to Unit 16;

2. Construct driveway and utilities serving Units 13-20.

C. Building Construction

1. Construct foundations and commence building construction for Units 13-20 (2 buildings);

2. Construct ancillary utilities, roof runoff basins and unit driveways through binder course;

3. Final landscaping and rain garden construction for Units 9-12 and 21-24.

PHASE IV

A. General Sitework

1. Install top course of paving and berms on main driveway;

2. Clean all stormwater best management practices in accordance with the Operation and Maintenance Plan;

3. Construct rain gardens for Units 13-20;

4. Install final pavement markings and signage.

B. Building Construction

1. Complete building construction for Units 13-20;

2. Final landscape construction for Units 13-20.

C. Final Cleanup

APPENDIX N
OPERATION AND MAINTENANCE PLAN

Permit Requirements

- Special Permit and Site Plan Approval for EHD
- Scenic Road Permit
- Stormwater and Erosion Control Permit
- Disposal Works Construction Permit
- Order of Conditions from Topsfield Conservation Commission

OPERATION AND MAINTENANCE PLAN

OPERATION AND MAINTENANCE PLAN
PROPOSED STORMWATER MANAGEMENT FACILITIES

THE MEADOWS
TOPSFIELD, MASSACHUSETTS

SEPTEMBER 2008

The following Operations and Maintenance Plan ("O&M") has been prepared to ensure that proposed systems function as designed. The O & M plan includes a maintenance schedule to ensure that structural and non-structural components are implemented properly and identifies the responsible parties.

A summary of the specific BMP's to be implemented at the site are as follows:

Non-Structural Methods

Source Control

A comprehensive source control program will be implemented at the site which includes regular pavement vacuum sweeping (at least four times per year), catch basin cleaning, Stormceptor cleaning, bioretention cell maintenance and stormwater basin maintenance.

Spill Prevention

A spill prevention plan that includes an emergency notification plan and cleanup program has been developed as part of the National Pollution Discharge Elimination System (NPDES) Construction General Permit.

Structural Methods

A. Deep Sump Catch Basins

1. During Construction

a. Protect catch basins grates with hay bales, check dams until base paving course is installed and landscaped areas are stabilized and/or vegetated.

b. Inspect basins monthly or following rainstorms of greater than one inch in 24 hours and clean when sediment levels are greater than twelve inches.

2. Long Term

   a. Inspect basins monthly and clean as necessary, but at least twice annually.

B. Stormceptor Units

1. Maintain in accordance with Manufacturer's recommendations (copy follows). The Stormceptor Units shall be inspected at least four times annually and after any spill event. The units shall be maintained annually and immediately following any spill event.

C. Snow Removal

Snow removal and/or storage shall be conducted in accordance with the Massachusetts DEP, Resource Protection Snow Disposal Guidance, effective March 1, 2001. Snow shall not be stockpiled on the rain gardens nor on top of catch basins and shall not be dumped or pushed into adjacent ways or wetland resource areas.

Snow stockpile areas shall be designated prior to snowfall (but not later than December 1st) with orange plastic temporary fencing. Snow stockpile areas shall be cleaned of any debris not later than May 15th. If snow exceeds the on-site storage capacity, it shall be removed to an approved off-site stockpile location. Only non-sodium based deicing agents will be used on walkways. No deicing agents will be used on paved areas.

D. Erosion Control Procedures

1. Staked hay bales, silt fence, temporary diversion swales and sediment basins shall be installed in accordance with this plan or as otherwise directed by the project engineer or the Conservation Commission prior to commencement of construction activities. 50 additional hay bales and 300 ft. of silt fence shall be kept on site for repairs or other erosion control needs. The contractor shall inspect erosion control facilities weekly and after every rainfall event to confirm that same are properly functioning. Any deficiencies in the erosion control facilities shall be corrected immediately.

2. All soil stockpiles shall be protected against erosion utilizing erosion control barriers and/or crushed stone filter dikes.

3. Catch basins shall be protected with filters, as shown on the plan, until no sediment transport is visible during rainfall events. Filters shall be inspected weekly and maintained as necessary.

4. Temporary erosion control measures to be taken during construction shall conform with the "Massachusetts Erosion and Sediment Control Guidelines, Urban and Suburban Areas" dated March 1997, and may include some or all of the following measures:

   - Temporary seeding
   - Temporary mulching (straw)
   - Permanent seeding
   - Hydroseeding
   - Sodding
   - Placement of hay or jute netting during winter months

5. Debris and/or litter shall be removed from the site on a weekly basis.

6. If dust is generated during construction, it shall be controlled by use of water trucks, sprinkling or temporary stabilization methods.

7. At the completion of the project, all disturbed areas shall be permanently stabilized with loam and seed or other ground cover. All stormwater BMP's shall be inspected and cleaned as necessary. Paved areas shall be swept.

E. Bioretention Cells

1. Bioretention cells shall be constructed following all other construction activities occurring near or on proposed cell locations.

2. Inspection

   a. Cells shall be inspected monthly throughout the growing season and bi-weekly in the summer; inspection shall include examination of plants and ground cover for pest or disease problems as well as sediment accumulation, erosion, mulch and overflow piping.

3. Maintenance

   a. Clean sediment accumulation if more than one inch in depth;

   b. Repair any eroded areas;

   c. Treat diseased vegetation as necessary;

   d. Remove and replace dead vegetation (April 1st – May 15th and/or September 15th – October 30th);

   e. Remove any invasive species;

f. Replace mulch every two years.

F. Infiltration Basins and Storage/Infiltration Vaults

1. During Construction

a. Before the development site is graded, areas of infiltration basins should be roped off to prevent heavy equipment from compacting the underlying soils.

b. Infiltration basins shall not be used as temporary sediment traps during construction.

c. Infiltration basins shall not be constructed until the entire contributing drainage area has been stabilized or silt fence constructed between the basin and upstream areas.

d. During and after excavation, all excavated materials should be placed away from the infiltration basins to prevent redeposition during runoff events. All excavated materials should be properly handled and disposed, during and after construction.

e. Light earth-moving equipment should be used to excavate the infiltration basin. The basin floor should be deeply tilled with a rotary tiller or a disc harrow to restore infiltration rates, after final grading.

2. Long Term

a. Infiltration basins should be inspected after every major storm for the first few months after construction to ensure proper stabilization and function. Thereafter, the basins should be inspected at least twice a year and following any occurrence of discharge through the high outlet orifice (2 year storm, 3.1 inches in 24 hours).

b. Pretreatment BMP's shall be inspected and the accumulated sediment and other debris removed in accordance with the recommended maintenance schedule.

c. The grass in the basins and on the sideslopes should be mowed, and grass clippings, organic matter, and accumulated trash and debris removed, at least twice during the growing season.

d. Eroded or barren spots should be reseeded immediately after inspection to prevent additional erosion and accumulation of sediment.

e. Deep tilling can be used to break up a clogged surface area. Any tilled areas should be revegetated immediately.

f. Sediment should be removed from the basins as necessary. Removal procedures should not take place until the floor of the basin is thoroughly dry.

This was on the computer → already - do you want it in there still?

g. If standing water is noted in the basin 48-72 hours after a storm event, it is indicative of clogging.

h. Semi-annual inspections are to check for signs of differential settlement, erosion, embankment leakage, tree growth on embankments, riprap condition, sediment accumulation and turf health.

G. Long Term Pollution Prevention Plan

1. Good Housekeeping

a. Inspect the site weekly, pickup and properly dispose of any trash, debris or branches;

b. Compost all landscape waste in an appropriate container or remove from the site to an approved waste area;

c. Inspect paved areas for any signs of oil drippings and apply an absorbent agent to such immediately;

d. Vacuum and sweep paved areas of site at least four times annually.

2. Storage of Waste Materials

Store any waste or recyclables in covered containers or a covered dumpster and remove such materials from the site on a regular basis, but in no case less often than weekly.

3. Vehicle Washing

No vehicle washing is to be done on site other than hand washing of vehicles owned by occupants of the residences.

4. Inspect and maintain stormwater best management practices in accordance with Sections A, B, E and F of this Operation and Maintenance Plan.

5. Spill Prevention and Response:

   A spill prevention and response plan will be included in the NPDES SWPPP.

6. Maintenance of landscaped areas shall be done utilizing off-site personnel: Use of herbicides and pesticides shall be minimized. Low nitrogen fertilizers will be used. Landscape maintenance supplies are not to be stored on site, except during actual landscape construction. Rain gardens shall be maintained in accordance with Section E of the Operation and Maintenance Plan.

7. Any observed pet waste will be cleaned up immediately and disposed of with regular site trash.

8. Snow management shall be in accordance with Section C of the Operation and Maintenance Plan.

H. Notification of Future Property Owners as to Requirements for Maintenance of Stormwater System.

A deed restriction will be placed on any conveyance of all units within the subject property referencing the requirements of this plan.

I. Plan

The proposed storm drainage BMP's are shown on Sheets 6-13 of the Site Development Permit Plan. An as-built plan will accompany the request for a Certificate of Compliance from the Topsfield Conservation Commission.

J. Operation and Maintenance Budget

An operation and maintenance budget will be provided at the time of a request for a Certificate of Compliance.

The party responsible for Operation and Maintenance of the Stormwater Management Facilities is:

New Meadows Enterprises, LLC
c/o Frank Iovanella
30 Wildes Road
Topsfield, MA. 01983
Tel: 978-887-3100

Or its heirs and assigns.

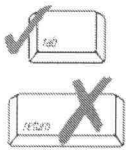
CHECKLIST FOR STORMWATER REPORT

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☒ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☒ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☒ Water Quality Swale
- ☒ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☒ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☒ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☒ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.